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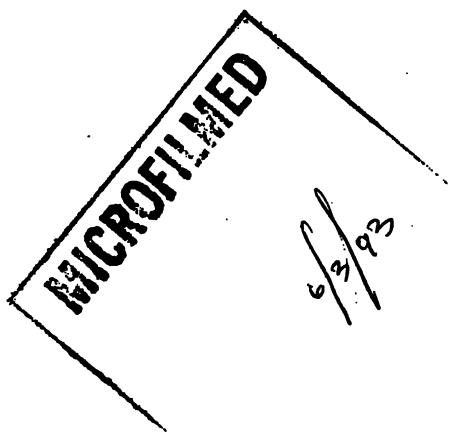
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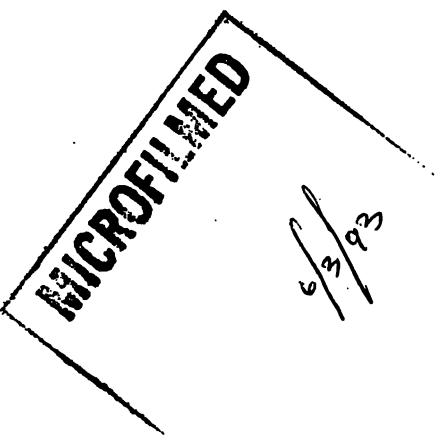
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میلاد

سید احمد







ON
THE FUNCTIONS OF THE BRAIN
AND
OF EACH OF ITS PARTS:
WITH
OBSERVATIONS ON THE POSSIBILITY OF DETERMINING THE IN-
STINCTS, PROPENSITIES, AND TALENTS, OR THE MORAL
AND INTELLECTUAL DISPOSITIONS OF MEN AND
ANIMALS, BY THE CONFIGURATION
OF THE BRAIN AND HEAD.



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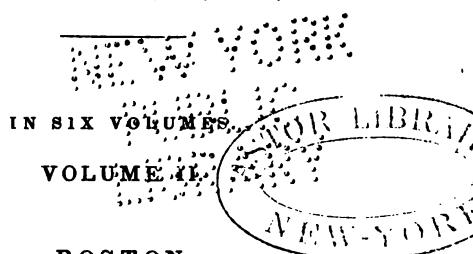
ЖИОУ МОЗИ
ДЛЯЧУ
УРАДЕЦІ



ON THE
ORGAN OF THE MORAL QUALITIES
AND
INTELLECTUAL FACULTIES,
AND
THE PLURALITY
OF THE
CEREBRAL ORGANS.

By FRANÇOIS JOSEPH GALL, M. D.

TRANSLATED FROM THE FRENCH
BY WINSLOW LEWIS, JR., M.D., M.M.S.S.



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INTRODUCTION.

HISTORICAL VIEW, AND IMPORTANCE OF THE STUDY OF THE STRUCTURE AND FUNCTIONS OF THE BRAIN.

To render the importance of the anatomical and physiological study of the brain more evident, I shall now, in a rapid sketch, compare the state in which these sciences were a short time since, with that in which they exist at present.

As man had no knowledge of the laws of organization, in order to obtain an explanation of the phenomena of life, of causes out of himself, of external principles, he was obliged to seek for a being, living, active, intelligent, existing by itself alone, whose presence diffuses life and activity over all the parts of the body, and whose separation abandons them to death and destruction. Aristotle, Galen, and their successors, down to the seventeenth century, attributed all the operations of life to a spiritual being, independent of all matter—to the soul. This agent so completely satisfied the wants of the philosophers, that they contented themselves with modifying it, from time to time, in conformity with the philosophy of the day. Borelli, Robinsion, Cheyne, Mead, Potersfield, like Lavater, saw, in the soul, the efficient cause of the organization. Swammerdam, Perrault, Stahl, Sauvages, made it the guardian of health, the cause of all the incidents of disease and cure. Thomas Aquinas gave to it unlimited power over the body, and Lippert, denying all mechanism, all organization, attributed immediately to the soul the excretions and the secretions, motion and sight; the muscles and

nerves were not allowed the smallest share of agency in the matter.

Many philosophers even furnished the brutes with a soul ; the pious and benevolent Bonnet promised them immortality.

But, in proportion as certain observers arrived at the knowledge of the properties of bodies, they abandoned these external agents. Already Empedocles, Leucippus, Democritus, the school of Hippocrates, the Stoics, Heraclides, Epicurus, Asclepiades, Archigenes, Lucretius, Aretæus, regarded life and all its operations as an effect of organization.

Naturalists observed the laws of the crystallization of earths and metals, the properties of plants, their fructification, their development, their secretions and excretions, their irritability, their sleep, their sympathies and antipathies, and found themselves forced to regard all these proofs of interior life and action, as properties of the vegetable kingdom. They should thence have inferred, that the same phenomena, or analogous phenomena in the animal kingdom, ought not to be derived from a different principle.

They remarked in the polypi, in the molusca, in insects, functions which announced a more complicated life, enjoying certain mechanical aptitudes, certain instincts ; but they also saw in them sets of organs of a more perfect nature. In fishes, in amphibia, in birds, in the mammalia, instincts, propensities, faculties, multiplied and improved with the gradually increasing number and perfection of their organs. These forces assumed more and more the appearance of spontaneity, and ended in man, by being ennobled into moral qualities and intellectual faculties, into reason and will. The nervous apparatus, the brains successively more and more perfect, pointed to the conclusion, that the functions corresponded with the perfection of the organization.

If learned men had never been led astray from this road, their progress would soon have been crowned with entire success.

But men are more disposed to give themselves to speculation, than to the painful study of nature. At each step the metaphysicians come in, to retard the progress of the naturalists ; and, in general, it is to the metaphysicians, that we must attribute the ignorance in which we are still involved, respecting the true nature of man ; and this shameful slavery will continue so long as we refuse to acquire the details of an organization, capable of explaining all the phenomena of sensibility, all the various instincts, propensities, and intellectual faculties.

Unhappily, the nervous system has been investigated with a slowness, which can only be explained by the numerous difficulties which have always opposed themselves to researches of this kind. It was especially the knowledge of the brain, which remained longest enveloped in darkness. Hippocrates took the brain for a sponge, which attracted to itself the humidity of the body. Aristotle judged it to be a mass, deprived of blood, humid, and destined to temper the heat of the heart. Praxagoras, Plistonicus, Philotinus, and the greater part of the anatomists of that period, maintained that the brain was but an excrescence of the spinal marrow, which contributed in nothing to the sensations. Mistilli named it an irregular and inorganic mass ; Astruc, a spongy substance. Several persons, both ancient and modern, take it for a prolongation of the blood-vessels. Willis, Leuwenhoek, Vieussens, Stenon, Santorini, were better informed of its structure ; and the greater part of the moderns place the brain in the nervous system. Yet Malpighi saw nothing in it but a collection of shapeless and confused intestines : there are those, who, even now, take it for a gland secreting an impure fluid. Sabatier and M. Boyer ranged it among the secretory and excretory viscera. Bichat saw in it only an envelope, destined to secure the parts situated on the internal base of the brain. Many are still faithful to the doctrine of Galen, and make the brain secrete in its ventricles the vital spirits, and distribute them, by means of the arte-

ries, to the other parts of the body, according to the example of Beranger, of Spigelius, of Vesting, of Willis, of Vieussens, &c.

It was no less difficult to gain a just notion of the internal structure of the brain. The brain is composed entirely of a gelatinous substance, more or less colored, and of a white substance, composed every where of fibres so delicate, and so closely connected, that, when cut, it appears to form only a uniform and pulpy mass. Anatomists made use of a particular knife, very sharp, very fine, very long, and double edged : they experienced the greater satisfaction, in proportion as they could make neater and closer cuts ; and whatever the incisions were, vertical, horizontal, oblique, from below upwards, or from above downwards, they thought so little of observing the connection of the parts, that they expected, with Vicq d'Azyr, to be able to examine them the better, as they were the more insulated by cutting. Ordinarily they began by cutting away the two hemispheres, down to the corpus callosum, so called, by forming artificially, the centrum ovale of Vieussens, never suspecting that, by destroying the two hemispheres, they also destroyed the complement of the cerebral organization, the expansion of the greater part of the nervous bundles, which form the convolutions of the hemispheres, the final parts of the organs of the moral and intellectual forces.

After these mutilations, which permitted no physiological view, nor any systematic examination, it only remained to seek hollows, ventricles, corpora striata, the cornu Ammonis, the *accessorius pes hippocampi*, the fornix, the pons varolii, the *lyra*, hippocampus minor, the nates and testes, &c. As for the nerves, they all took their rise in the brain ; the nervous system of the vertebral column was a prolongation of it.

It is in this way, that the various parts of the brain have come to be represented only as lacerated, and insulated ; nothing but false ideas have been entertained on the direction of the fibres and the nervous bundles,

on the interior tissue of the annular protuberance, of the thalami nervorum opticorum, of the corpora striata ; anatomists have never observed the relation, or the proportion of some parts to others, or to the whole ; nor have they ever seen the slightest trace of any use of them, or any law. All has been conceived and reported in the most arbitrary disorder ; and this makes it so difficult, to satisfy ourselves of what some authors have committed to writing, however imperfect.

Still, men were generally so well satisfied with these discoveries, that they generally thought there remained nothing to discover in the brain. Meckel thought that all the discoveries which remained to be made, could have no other object than the origin of the nerves. Accordingly, it was to this point, principally, that Soemmering directed his researches. After the works of Vicq d' Azyr, of Prochaska, of the brothers Wenzel, every body said, and Peter Frank said to me in private, that it was a ridiculous presumption, to think of finding any thing new ; still more so, to think of finding an organization wholly different from that which had till then been admitted.

In fact, had men continued to confine themselves to the usual methods, it would have been impossible to obtain any clearer results. There were wanting physiological principles, proper to lead anatomists, by degrees, to a knowledge of the laws of the cerebral organization. Men had neglected to observe the mode of the gradual perfection of animals, and, consequently, could not form to themselves any idea of the order in which the different cerebral parts, the new organs of the new faculties, had been successively added to the pre-existing parts. This prevented their making any anatomical research into the brain, in an order conformable to the process of nature.

It was the same with the labors of those, who cultivated comparative anatomy. At first, their comparisons were almost always limited to the grosser parts. What benefit will accrue to us, from knowing all the muscles

of the snail and camel, of the elephant's trunk—all the forms of the bones and intestines of animals, from the shrew-mouse to the whale? If I have made comparative anatomy enter into my researches, it was only so far as it could aid me, in arriving at the discovery of the laws of organization. The comparative anatomy of the brain, applied to the different faculties of animals and of men, may be useful, to establish the physiological discoveries made by other means. But this is an application, which has been rendered impossible by the generally received philosophy. Besides the fault committed, in comprehending all the particular faculties of species, and of individuals, under the general expression of instinct, too little attention was paid to their intellectual and domestic conduct, in a state of freedom. Nature constantly follows a general type in all the modifications of analogous organs; and he who knows how to investigate,—to discover this general type by comparing analogous systems in different animals, has discovered, by comparative anatomy, a law, which he will meet in man, as well as in other animals. Those who have followed the counsels of Haller and of Stenon, have sometimes succeeded in adding to our anatomical knowledge of the structure of the brain. But, with the purely mechanical views which they brought to the subject, they could furnish no result for the physiology of this organ.

The structure of the brain has, therefore, been so little known till our discoveries, and this knowledge has been so vacillating, so contradictory, that it has only been possible to a few individuals, of penetrating genius, to conjecture rather than determine its functions in a general manner. As for the others, what connections could there be, what relation, between instincts, propensities, intellectual faculties, and a spongy, inorganized, pulpy substance?

As the soul was thought to be the source of the instincts, propensities, faculties, it was made a great and very serious occupation to find their seat. Sometimes it

was spread through all the body, sometimes lodged in the brain ; and, keeping in view the simple essence of the soul, the metaphysicians, and with them the physiologists, have been obliged to compress it to a single point, the most simple possible point. It was from this point that the soul directed all the remainder of the body, that it made all its moral and intellectual forces to radiate, without the intervention of any other cerebral part.

In place of seeking simply for phenomena, men confined themselves, as is yet the custom, to philosophic subtleties ; exhausted themselves in speculations on the intimate nature of the soul ; and tried to discover how souls and bodies were united, whether immediately, or by means of an intermediate substance. They attempted to penetrate the essence of this substance of union, which must be half body, half soul ; they sought to discover how mind and body, how the brain and nerves act reciprocally on each other ; if sensations and ideas are the results of impressions made in the brain ; if any traces of them remain, and how they are renewed. While men amused themselves with such revueies, it was scarcely possible to conceive a sound idea on the true office of the brain.

Leaving the epoch when the brain was generally regarded as the organ of the soul, we find that the ideas entertained on this subject, always remained indeterminate, vague, and inconstant. Men had, indeed, collected facts which led to the suspicion of the plurality of the organs of the functions of the soul ; but this proposition always revolted, and still revolts, the partizans of the unity of self. In vain were opposed to them the multiplicity of the organs of automatic life, the multiplied systems of voluntary motion, the plurality of the five senses, which do not at all infringe on the unity of life, and of individual consciousness.

Men were still much more unwilling to make the superior faculties of the soul, thought, understanding, judgment, imagination, reason, depend on the cerebral parts. The examples of idiots, cretins, hydrocephalous per-

sons, of the insane, the consequences of lesions and maladies of the brain, could not dissipate their illusion. In animals they branded as mechanical faculties, intelligence and memory, which they could not refuse to allow them.

The affections, passions, instincts and propensities, long before the time of Cabanis, had been well placed in the organization. But, with the exception of two or three physiologists, such as Bourkard, Van Swieten, they placed them, and still place them, with great predilection, in the blood, in the temperament, in the viscera of the abdomen and the chest, in the ganglions, and ganglionic nerves.

Even now, men are obstinately bent on deriving the qualities and the faculties of men and of animals, that is, their instincts, propensities, talents, from education, sensation, attention; since they regard them all as simple modifications of one same sensibility, how could they have arrived at the notion of suspecting one or more organs of all these forces in the brain?

Did they not admit, and are there not still anatomists who admit, that the brain is nothing but the concentration of all the nerves, the source of all the nerves, and a compound of all their extremities? In this case, how can we attribute to it other functions than those, which belong to the nerves of the senses, to the nerves of the voluntary motion, and to the nerves of the organs of nutrition?

The gentlemen of the committee who drew up the report on our memoir, presented to the institute and their partizans, still say, with complacency, that we do not know to what part of the encephalon, nor to what circumstance of its organization, the intellectual faculties are attached. Yet, comparative anatomy teaches us with certainty, that the organ of the faculties of the soul is not limited to any portion of the cerebral substance; it teaches us, that it is only the hemispheres which establish the most essential difference between man and the different species of animals, and between

the different individuals of the same species, in relation to the moral and intellectual forces : we also know that the functions, proper to each system of nerves, are realized in their peripheric expansion. Now I have demonstrated, that the convolutions of the brain are nothing but the peripheric expansion of the bundles of which it is composed ; consequently, the convolutions of the brain must be recognized, as the parts in which the instincts, sentiments, propensities are exercised ; and, in general, the moral and intellectual forces.

For several years before my tour, my discoveries were spread into all parts of Europe, by the hearers of my lectures at Vienna. Thus the world was no longer ignorant of my doctrine. I have, however, every where met the same erroneous opinions and prejudices. It is true, the multiplied and material proofs with which I surrounded my propositions, struck the greater number of my auditors so forcibly, that I soon had thousands of partizans, as well among my brother physicians, as in all classes of society. It is well known, with what enthusiasm Reil and Loder received my discoveries. It was not so with professors Walther, at Berlin, and Ackermann, at Heidelberg : it is well known with what animosity they combated, indiscriminately, my anatomical and physiological discoveries.

Arrived at Paris, we obtained, at first, the most brilliant success by our anatomical demonstrations. The first men in the art were filled with admiration of them. A short time after, the emperor arrived from his campaign in Germany. I know not with what terror he inspired the members of the Institute of France ; but, as if by a charm, every thing suddenly changed its appearance. All that I said, all that I demonstrated, was now regarded as senility, as charlatanism, juggling, as they were pleased to report it to their monarch. Hence resulted that famous diplomatic report on our memoir, presented to that learned society the 14th March, 1808. This same report will serve to prove to my readers what were then the views and intentions of the com-

mittee, respecting my anatomical discoveries, and respecting a part of my physiology of the brain.

They attributed to the ancients our method of dissection, and four other points. For reasons already given, it was not possible for the ancients to know either of these points, especially our method of dissection, founded not only on the direction of the fibres, but also on the principles of comparative physiology. In my answer to this report, I have proved, that our method was not followed even in its mechanical details, much less according to the same principles of comparative anatomy and physiology. It is absolutely the same in respect to the four other points.

Were it even proved, that our predecessors had known any insulated fact without any connection, this kind of charge would be rather the expression of jealousy than of justice; for, all the truth, that has been published on the brain, is confounded with so great a number of errors, and bears so little the impress of truth, that the reading of it cannot possibly furnish any just principles on this part of anatomy. "What the ancients and the moderns have taught, touching the brain," says Steno, "is so full of disputes, that the books of the anatomy of this part, are not more numerous than the quicksands of doubt and controversy occasioned by them." It is certain that this great diversity of views and opinions on the same subject, far from facilitating its study, serves to embroil it and render it more difficult; and that we should have needed many more researches, more cares, and more sagacity, to arrive at the same end by following the track of our predecessors, than by making a new road for ourselves.

The authors of the report in question, have passed silently over eleven points; as, for example, the formation of the convolutions of the hemispheres on the different bundles of nerves, which pass out at several points from the optic thalami, and the corpora striata, a very important object for the progressive organization of the hemispheres, in the different species of animals; since, by losing sight of it, the comparative anatomy of

the cerebral parts becomes impossible in their respective relations with the faculties of animals.

They have left in doubt the non-existence of a sole centre for all the nerves, the natural and artificial unfolding of the hemispheres, and the plurality of the organs of the moral qualities and the intellectual faculties, besides eight other points, all equally acknowledged at the present time.

They have allowed us eighteen essential points of our discoveries.

After all these misrepresentations, denials, concealments, doubts, and concessions, the gentlemen of the committee terminate their report by saying,—“We conclude with almost as much doubt and uncertainty as we commenced,” and “new methods of dissection of the brain, new connections and directions, perceived between the different masses and the organic elements which compose it; new peculiarities remarked in some of its parts, constitute all the real discoveries which we have been able to make.”

My adversaries have seized, with avidity, all the equivocal passages of this strange report, to promulgate them in the public papers and in the literary journals, under the title of extracts from the Report of the Committee of the Institute; in regard to some, carefully suppressing our anatomical discoveries; in regard to others, presenting them as already old; and, finally, by bestowing on the reporters, at our expense, all that our memoir contained, which was new or useful. Agreeing only in a single point, that of discrediting my doctrine, they differed from each other in their statements, according to their previous notions and accessory views. “The principal merit of Messrs. Gall and Spurzheim,” said these critics, “is that of having forced Cuvier to occupy himself with the anatomy of the brain. This illustrious philosopher has made numerous researches on this viscus in man and in animals; he has discovered numerous very important facts, which he has collected in his report, together with those which he had long

since observed ; he has given extremely ingenious views on the functions of the brain," &c. What are these important facts ? What are these ingenious views ? Cuvier has certainly too much real merit to have need of these false adulterations. And besides, at the very time when he was struck with my dissections, he informed me, that he had never devoted himself to the particular study of the nervous system and the brain.

If it be a merit to have attracted attention to an object, it is a yet greater one to have opened the road, and to have given a right direction to it. Let any one compare the works of Reil, who has published his researches on the brain, after having assisted at Halle, at our dissections ; let him compare the successive improvements both in the lectures and the works of Richerand,* Beclard, Blainville, Sene, Georget, Lallemand, Tiedemann, Carus, &c., and he will be astonished at the accessions, which have been made since the appearance of my doctrine.

In what, then, does the mode of my researches differ from that of my predecessors ?

It was only, I repeat, after having familiarized myself with the gradual march of improvement of the animal organization, as well as with the multiplication and the proportionate elevation of the faculties which result from it ; it was, in fine, only after having gathered a large number of physiological and pathological facts, that I was able to seize the principles, according to which researches should be directed, respecting the nerves and particularly respecting the brain. As soon as I found myself in the right path, it was sufficient for me to pursue it without unceasingly employing mechanical processes. It is thus I have succeeded in finding and placing in the rank of permanent science, the structure, the arrangement; the gradual perfection, the connection and the relations of the several parts of the brain.

* And when Richerand shall have fulfilled his duty as professor, and have studied the physiology of the brain, all this part of his work will be found totally changed.

I have brought order, unity, and life, into a study over which, till now, there reigned only confusion. Where were only seen mechanical forms and fragments, I have shown arrangements for the manifestation of the moral and intellectual forces.

But, let us say, the gentlemen of the Committee have pretended that my doctrine on the structure of the brain, has no necessary and immediate connection with my doctrine on the functions of its different parts. In this way, they again separate physiology from anatomy, and destroy the relations of the organs with their functions.

Yet the authors of this assertion, Messieurs Sabatier, Portal, Cuvier, have themselves, according to the example of Willis, Haller, Prochaska, Vicq d' Azyr, and Soemmering, interspersed, in their anatomy of the brain and its nerves, a great number of physiological and pathological observations, such as they are. The same men acknowledge that the brain is the immediate instrument of the soul; that, consequently, its anatomical examination is very important; they believe that we can only explain the loss of some intellectual faculties in certain cases, by admitting that the brain is composed of several partial organs. They conjecture that the smallest parts of the brain, such as the infundibulum, the corpora, mammillaria, the pineal gland, &c., have their particular functions; they even fix the attention of physiologists on the relation of certain parts of the brain, with certain dominant faculties, and they hope that comparative anatomy will be able to inform us of the functions of each part of the brain: all this indicates certainly, without doubt, that they admit a necessary and immediate alliance between the structure of the organs and their functions, or between anatomy and physiology. Whence, then, these contradictions, when the question concerns *my* anatomy, and *my* physiology of the brain?

The case is different, when it is maintained, that the knowledge of the structure of a cerebral part has never, till the present time, led to the discovery of its functions. The knowledge of the functions has always preceded

that of the parts. It is, also, as I have said elsewhere, without the aid of the anatomy of the brain, that I have made all my physiological discoveries ; and these discoveries might have existed for ages, without their agreement with the organization having been detected.

Anatomists, seeing the great diversity of the constituent parts of the brain, should have been the first to deduce from it the diversity, and, consequently, the plurality of the organs of the moral qualities and intellectual faculties. But, when we see that Vicq d' Azyr, after having synthetically constructed the human brain, by ascending from the insect to man, and then analyzed it, by descending from man to the insect, did not dare to declare his disbelief of the residence of the soul in one single organ, we learn how little the mere knowledge of anatomical arrangement can enlighten the physiologist. Let man confine himself to the phenomena of nature, regardless of any of the dogmas of metaphysical subtlety ; let him utterly abandon speculative suppositions for positive facts, and he will then be able to apprehend the mysteries of organization. Herder, struck with the phenomena of the understanding in different animals, and in different individual men, conceived the idea of the plurality of the intellectual organs, and even indulged the hope that he might, by an attentive comparison of the different brains, discover in them, those organs, and their peculiar qualities. Bonnet imagined that the brain was composed of fibres, each one of which would have its particular function ; and he saw, though imperfectly, the possibility of a physiology of the brain. " Hence it follows," says he, " that an intelligent being, who should thoroughly comprehend the mechanism of the brain, and should see, in its minutest detail, all that is going on within it, would read, as it were, in a book. This prodigious number of organs, infinitely small, appropriated to sentiment and to thought, would be to such a being, what printing types are to us. We turn over the leaves of a book, we study them ; this intelligent being would contemplate nothing but brains." If

I have arrived at an anatomy of the brain, which time shall never overthrow, and which exhibits, throughout, a perfect concordance between the moral and intellectual phenomena, and the material conditions, I owe it almost entirely to that immense number of physiological and pathological facts, which I have been so unceasingly accumulating.

Every doctrine of the functions of the brain must be false, if such doctrine be found contradictory to its structure. Admitting, for instance, that there is a central point, from which all the nerves radiate, and regarding this central point as the only, the exclusive organ of the soul, how shall we explain the successive development, the separate action, and the partial diminution of the different intellectual faculties? If other mammalia really have all the parts of the human brain, how is it possible that man should be endowed with more numerous and more sublime faculties? If all parts of the human brain are found to be equal in all individuals, and always have the same relation to each other, how can we conceive of the different degrees of each faculty, or of each propensity, in different individuals, or even in the same individual? If a single case of hydrocephalus can ever be found where most of the intellectual faculties remain unaffected, while the brain is entirely disorganized; if it can be proved that the brain is a mere medullary mass—this, by exhibiting my physiological doctrine, as directly contradictory to the actual organization of the brain, would sap the foundation of the doctrine, and annihilate it, with all its consequences.

But, if it be a constant fact, (truth,) that animals devoid of every thing like intellect, are also destitute of brain, and are only provided with inferior nervous systems; that these systems are multiplied as their vegetative life becomes more complicated; that a faculty of the animal life, as instinct, talent, &c., cannot be perceived, except conjointly with a brain; that the constituent parts of the brain, from the worm up to man, are found to be multiplied and varied in the same proportion as the faculties

are so ; that all facts coincide in proving that an extraordinary energy of a faculty always corresponds to an excitement, and, above all, to an extraordinary development of some part of the brain ; that the derangement of a faculty is connected with lesion, loss or disease of its nervous apparatus ; if, in fine, it be an immutable truth, that the brain is composed of a nervous system, different from all others, and divided into several departments, (departitions,) distinct from each other ; that the diversity of their origins, their fasciculi, their directions, their supplements, (complements,) their points of union can all be demonstrated to the eye ;—then, I say, it is beyond all doubt, that the anatomy of the brain is in perfect accordance with my physiology of the brain ; and the metaphysician will in vain pretend, that the intellectual operations are so obscure, that it would be impossible to discover their organs or their material conditions.

The gentlemen of the Committee, not satisfied with being constantly at variance with their own principles ; not content with subtle, shunning subterfuges, have otherwise disclosed their policy, and the inconstancy of their views, (aveus.) Who would have believed that they were disposed to doubt even the possibility of a physiology of the brain ? "The functions of the brain," say they, "suppose a mutual influence, incapable of being comprehended, between divisible matter and indivisible identity, (moi,) an insuperable hiatus in the system of our ideas, and the perpetual stumbling-block of all philosophers. Not only do we not comprehend, and never shall comprehend, how delineations, impressed upon the brain, may be perceived by the mind and produce images there ; but, however delicate our researches may be, these delineations never exhibit themselves to our eyes in any shape, and we are entirely ignorant what their nature is, although the effect of age and diseases upon the memory leave us no doubt of their existence or of their seat."

"In a word," they go on to say, "no one who has

labored upon the brain has been able to establish, rationally, a positive relation between the structure of this viscus and its functions, even those which are the most evidently physical. The discoveries in anatomy, hitherto announced, are limited to some circumstances in the forms, connections, or tissue of its parts, which had escaped older anatomists; and whenever any one has attempted to go beyond this, he has merely inserted between the structure discovered and known effects, some hypothesis which is scarcely capable of satisfying, for an instant, even superficial minds."

M. Delpit has again advanced the same passage, *Dict. des Sc. Méd.*, vol. xxxviii. p. 258, adding, that it is impossible to say, whether there are really as many separate seats as there are different operations; and, *a fortiori*, to determine precisely, these different seats in the brain.

M. Delpit, after extolling the advantages to be gained by the facial line of Camper, says, p. 269,—“The principal part of man, that, at least, which constitutes his superiority over all created beings, has neither a determinate seat, nor determinate local points; it carries with it no character, no sign accessible to our senses; the mode, as well as the seat of its operations, conceals itself from the scalpel, from the touch, from the eye, and from every other means of research, physical or material.”

M. Reydellet, vol. xli. p. 580, says, also,—“It will always be impossible to detect the essence and nature of thought, as well as to determine, even by approximation, the parts of the brain which contribute to it; because its intimate organization will always be a secret to the anatomist, as the comprehension of it will be to the physiologist.”

But let us not be dismayed at these alarming sentences. M. Reydellet vacillates, as well as his prototype, and, throughout two thirds of his discourse, he ranges himself, in every respect, on the side of *organoscopy*. M. Delpit, also fearing that cranioscopy might be proved, consoles himself with the reflection, that it will only be

proved by an empirical method ; that is to say, as the ear is proved, empirically, to be the organ of hearing, although it is absolutely impossible to conceive of the relation of the auditory nerve to sound.

Those who have not thoroughly studied the physiology of the brain, can have no consistent ideas about it. They are always balancing between two altars ; sometimes they courteously incline to the left, to worship false gods ; sometimes the force of truth draws them to the right, and extorts from them involuntary homage.

Let us revert to the passages. I am there accredited with the presumption of hoping to explain the essence and *modus operandi* of the nervous system, particularly that of the brain. On the contrary, I have always maintained, that we must not attempt to explain the first causes of a phenomenon, whether of organic life, or of animal life. I attempt to determine, not by mere reasoning, as it is insinuated, but by the constant and repeated comparison of a great multitude of facts, the conditions necessary for the production of such or such a phenomenon in the living organization. Is it, therefore, so difficult to comprehend the difference there is between *explaining* the cause of a phenomenon, and *indicating* the conditions necessary for its taking place ?

If the physiology of the brain supposes a knowledge of the influence of the soul and of the body, its nature would not manifest itself to us in any respect ; for we know not a single essential principle of it. For instance, we should not know that motion is the product of muscular action, since the nature of irritability, which is its primitive cause, is unknown to us : we should not know that food nourishes the body, since we do not comprehend the primitive forces of assimilation : all the functions of the senses would be still unresolved enigmas, since we are yet to discover how we receive the consciousness of the sensations of sight, hearing, and taste. Need we more, to show, that neither the knowledge of an essential principle ; such, for example,

as life; nor that of the relation of the soul, with the body, is necessary, to understand the conditions of the phenomena of a living body.

But if, perchance, the physiology of the brain should support itself, an expedient must be devised to eclipse the merit of its author. "So long," say the Committee, "so long as not even a conjecture can be advanced, founded on the functions of the pituitary gland, the infundibulum, the mammillary eminences, the portions (tractus) which go off from these eminences, into the midst of the thalami, of the pineal gland, and its peduncles,—it is to be feared, that any system whatever, of the functions of the brain, would be very incomplete; since it will not include those so numerous, so considerable, and so intimately connected parts of this noble viscus."

These parts, so numerous, so considerable, the pituitary gland, &c., when taken together, scarcely amount, in a man, to the weight of a dram, whilst his brain weighs from two to three pounds, and sometimes more. It is apparently to the public, only, that they would care to represent as so numerous, and so considerable, parts, which amount, at most, to not more than a three-hundredth part of the brain.

I do not deny that these parts may answer very important purposes, because they are generally met with in the mammalia, and because they are even greater, proportionally; in brutes than in man. But these two circumstances demonstrate, conclusively, that they are not to be considered as organs of the superior intellectual faculties. Moreover, I have rendered it very probable, that all these parts, far from being complete organs, are merely ganglions, apparatus of reinforcement for the true organs. It is thus, that the anterior tubercula quadrigemina, the corpus geniculatum internum, a part of the gray substance of the crura cerebri, and that also which is accumulated near the conjunction of the optic nerves, and lastly, the retina, form one single organ, the organ of sight, &c.

The passage which I have just cited, agrees very

well, as to its meaning and tenor, with the ideas of some of my German adversaries. Ackermann and Kessler, overcome by the evidence of facts, were obliged to close by saying, that all my discoveries must be regarded as amounting to nothing, since I had not been able to demonstrate the vital principle, or life itself, and to explain the functions of the soul.

I grant more than any of these gentlemen desire: not only am I ignorant of the functions of the mammillary eminences, &c., but also of many parts of the cerebral hemispheres, which are really considerable. How happens it, that the physiology of the brain, a science already so important, based on so great a number of most interesting facts, so fertile in results, relating to the knowledge of physical and moral man, falls at once into contempt, because it is not yet complete? On this ground, agriculture, chemistry, physics, natural history, anatomy, and physiology in general, would yet be objects little worthy of consideration, since they are yet susceptible of numerous improvements.

As I am very partial to the heroine of my story, the reader will be so kind as to allow me to entertain him a few moments more with her adventures, before indicating any new proofs of the importance of the study of the brain.

We may judge how much the new physiology of the brain crossed the path of the chiefs of the school of medicine, by the extreme circumspection which the students were obliged to assume in their conduct.— Some spake of my discoveries, at the same time pretending to blame me, and to arrogate the honor for their professors; others appropriated my ideas to themselves, without daring to indicate the source from whence they derived their riches; others published extracts from my course, but took good care that my name should not appear; and others, finally, were expelled from the learned societies, because they declared themselves partizans of the extravagances of the German doctor.

Gradually, however, their minds became calm, but they were not able to repress, entirely, their illiberal rancor. It is well known that throughout our writings, we announce my doctrine as the *anatomy and physiology of the nervous system in general, and of the brain in particular*. I have uniformly declared that the examination of crania and headmuds was necessary for attaining, by means of observation, a knowledge of the functions of the different cerebral parts. This part of my doctrine is to be designated under the name of cranioscopy. Yet the claim to physiology and physiologists is not allowed us, and ourselves and our labors are viewed merely in the light of cranioscopy and cranioscopists. M. L. B. Cuvier,* says,—“Dr. Gall pretends that each sentiment, each propensity, each particular modification of our faculties has its seat in some circumscribed region of the brain; that the size of these various particular organs necessarily involves the degree of predominance of their correspondent dispositions; and that their prominence, exhibiting itself at a certain point on the exterior of the cranium, may afford a pretty accurate means of estimating individual character. He pretends to have collected facts enough, by observing the crania of individuals remarkably distinguished for certain faculties, or who have unreservedly abandoned themselves to certain vices, to deduce from them general rules, and to form therefrom a science, which he has called *Cranioscopy*.”

In my doctrine I prove, by the way, that there are as many different organs as there are propensities and faculties *essentially* distinct. That there are as many organs, as there are *modifications* of the propensities or the faculties, I have never supposed. Are there as many stomachs, as many different organs of sight, as there are modifications of digestion and vision? And why does M. Cuvier still adopt the language of the ancient contributors to the *Journal de l' Empire*? Have

* Dictionnaire des Sciences Naturelles, viii. p. 16.

I not, both in my writings and in my public lectures, sufficiently refuted the absurd idea of the *irresistibility* of our propensities and inclinations?

M. Broussais* in the *Annales de la Medicine Physiologique*, has given an account of the real service which the *cranioscopic* school has rendered to medicine.

Some there are, who, like the vulgar, speak with a jeering satisfaction of *bumps*, &c., such as M. M. Richerand, Virez, &c.

Is this because these gentlemen still obstinately disallow of a physiology of the brain? or is it because *cranioscopy*, *cranioscopic school*, and *cranioscopists*, seem to them terms well calculated to mislead the public as to the true nature of my researches? And yet it is to this cranioscopy, to those researches so laborious, so numerous and so costly, that they are indebted for a physiology, and, consequently, for the most essential part of the pathology of the brain! There is no other possible means of discovering the functions of the cerebral parts; all others, at best, only serve to confirm what has been ascertained by the inspection of crania and heads.

There is still such an aversion to the physiology of the brain, that certain learned bodies regard it as criminal in me, to have taught it during my travels. This procedure, say they, is contrary to the custom of our times; it is unworthy of a scientific man. These reasons seem to me like mere pretexts. It was, in like manner, an outrage upon good manners when Democritus sought for the cause of insanity in the dead body: it was contrary, also, to good manners, when I began to make a collection of heads: it is but a short time since a minister prohibited me to mention the dissection of the brain of a poet, because, as he said, it was not agreeable to French customs. Naturalists ought to have none of these customs; they should disregard the

* Examen des Doctrines Medicale, ii. 584.

prejudices of ignorance and superstition. Moreover, it is impossible, that these men should not understand what immense advantages we must have derived from my travels, without which, my doctrine would never have been thoroughly known out of Vienna.

The anatomy and physiology of the brain, are, from beginning to end, experimental sciences. Teach your pupils any part of anatomy whatever, from the very best drawings, if you can : teach them to know a metal, a plant, an insect, a fish, a disease, without placing these objects before their eyes. Reading may enable them to comprehend the principles and general results of my doctrine very well ; but the facts, from which these principles and results have been deduced, must absolutely be demonstrated.

Hitherto, no one ever dreamt of making a collection of busts, of the heads and crania of men and animals, with a view to the study of their particular forms, from an observation of the prominent traits in their qualities, and in their faculties, in their instincts, propensities and passions. Even at the present moment, so indistinct a view of the utility of such a collection, have academies and governments, that they would sooner furnish means for making a collection of Chinese butterflies. Private individuals shrink from the expense and the difficult and innumerable researches, which a well chosen collection would require.

No organ is more easily demonstrated than the organ of the propensity for propagation, and that of the love of offspring, (progeniture.) It is easy to see, that the inferior occipital fossae are sometimes larger, and sometimes smaller ; that the superior protuberance of the occipital bone is sometimes more, and sometimes less ample, (omblée.) Nevertheless, there is no anatomist nor physiologist, who, without having been instructed, without having exercised both his eyes, and his touch, and his mind, would be capable of judging with confidence of differences so wide. Books will suffice, when the practice of the doctrines has passed through the hands of many ob-

servers, and the art of examining the forms of heads, crania, and busts, has been propagated by tradition. My travels have, in fact, advanced this science in a few years, more than the best written books would have done in as many centuries.

Let us take an example. Frequent pathological phenomena led to the suspicion and consequent discovery of the decussation of the nervous fasciæ, whose successive accumulations form a great part of the hemispheres of the brain. This interlacing was described by Areteus, and by Cassius. Francis Pourfour, du Petit, and Santorini, described it more accurately. Nevertheless, most modern authors either persist in denying this interlacing, or have a totally false idea of it. Vicq d'Azyr, never knew of the true decussation of the corpora pyramidalia. Dumas and Boyer maintained that it could not be demonstrated, by any method. Sabatier denied it, and Chaussier attributed it to the tension which was employed upon the part, which, before tearing, became stretched, and assumed a fibrous appearance. Nothing but our demonstrations have brought the opinions of anatomists on this point to a close.

What difficulties have we not encountered; how many times have we been obliged to go over the demonstration, to make the formation and unfolding of the hemispheres understood? The fibrous structure of the white substance of the brain and of the spinal cord, is proved beyond a doubt; and yet, in the work of M. M. Martinet, and Jarent, on the inflammation of the arachnoid, the expressions *cerebral pulp*, *spinal marrow*, &c., are retained, both by the authors and by M. M. Duméril, Pelletan, and Hallé, the gentlemen who reported upon it. We find the same in the *Dictionnaire des Sciences Médicales*.

Listen, also, to Vicq d'Azyr, in his discourse on general anatomy. "Let those," says he, "who would persuade themselves, that in order to get an exact knowledge of the body, it is enough to read the best descriptions, be good enough to consider with me, how deceptive their

hope is, and of how much gratification they deprive themselves, by declining the pleasure of seeing and observing for themselves. I had studied a long time over the writings of Harvey, Malpighi, and Haller, and I flattered myself that I had learnt from them the structure of the chick, and its connection with the different substances of which the egg is composed. How surprised was I, when comparing the object itself with the picture I had imagined of it. I found the most of my ideas were inaccurate; and that the images suggested by different books, differed in *many important* points from nature! Another thing I remarked; that from the details given by authors, I could not satisfy my curiosity, till after long and severe efforts to comprehend the sense of their works, whereas the first glance of the palpitating embryo in the cicatricula (or treadle) of the yolk, produced in me the most lively emotion, and at once inspired me with great interest in this astonishing spectacle."

For this reason, I have little confidence in societies, formed in any country, to verify or to refute my discoveries; unless there be within them men who have assisted at our anatomical dissections and our physiological demonstrations, and who have carefully trained themselves there by long exercise.

If those gentlemen could have ascended to the idea of a physiology of the brain; if they could have conquered their self-love, and if they had followed our dissections, and especially our physiological demonstrations, their ideas would have been enlightened; and instead of disdainfully censuring our proceeding, they would have admired our courage and our perseverance, and the multitude would no longer say with M. le B. Cuvier, "it would be well, if these different views furnished sufficient data on the usages of the different parts of the brain;" "pretensions founded merely on a few ill-observed facts," &c.

I have spent more than thirty years in collecting facts, either physiological, or pathological, in regard to man and animals. Every body who has followed our course

and read our works, is astonished at their immense number. There is no physiological proposition, which is fortified by so many proofs; and yet people presume to use this language, as imprudent as it is self-conceited! Let any one attempt to overthrow my proofs for the organ of the propensity for propagation, of the love of offspring, of the carnivorous instinct, of the sentiment of property, of the relations of space, of music, of numbers, &c.

It is easy to understand, why all the fundamental forces and their organs, are not susceptible of an equal number of proofs, and proofs of the same kind. The faculties peculiar to man alone, are, in this respect, enclosed in a much narrower circle than those common to man and animals. I should produce volumes on each organ, were I to bring forward all the individual experiments which I have made in discovering it, and which daily furnish me proofs of it. Observers, who have learnt how to separate the accidental from the essential, who know the uniformity and constancy of the laws of nature, know also how far it is desirable and indispensable to accumulate experiments. But let one of these sceptics meet with a fact, which goes *to support* one of my discoveries—with what ardor does he seize upon it! How much greater is this enthusiasm! how much more lively is this conviction, than the thousands of facts observed by me, have been able to effect!

The following passage closes in a manner so amusing, that I cannot forbear citing it entire.

“ It is believed that one cannot study too minutely, the action of each muscle. Numerous hypotheses have been invented to explain digestion; whole volumes treat of respiration, reparation, the secretions and nutrition. But the more important subject of the cerebral functions has been left to philosophers unacquainted with physiological knowledge. Is not the brain, then, one of the organs of the human body? Why is not the history of all the relations which exist between it and the senses, between it and the other viscera indispensable

to the maintenance of life, thoroughly investigated by physicians? If so much obscurity still prevails in regard to the action of the organs upon the brain, and of the brain upon the organs; if a host of physical or moral phenomena which depend on this reciprocal influence, are not yet understood, is it not to be attributed to this separation of the branches of the same science? Cabanis has cleared up a part of this fertile field. Professor Pinel has shown how fruitful the physiological study of the intellectual faculties is, in precious results. What physician will hereafter associate himself with these two celebrated professors, and will add to their labors, what is necessary to supply their deficiency?"*

Here is an example of the lethargy in which M. M. Begin and Fournier have been immersed, from the time of my arrival in Paris, in 1807, to the year 1819!

For some time past I have remarked with pleasure, that the idea of the plurality of the organs of the moral and intellectual forces, is becoming familiar. The greatest obstacle which now remains unsurmounted, is, the philosophy which has been received for so many centuries, on the nature of these qualities and faculties. There is less objection to organs for the instinct, the affections, the passions, attention, memory, judgment, imagination, will, &c., than to organs for a propensity to propagate, for the love of offspring, for music, and even for poetry, &c. Let any one read my treatises on the fundamental faculties, the history of their discovery, their natural history, the proofs drawn from man and animals, their modes of action in the different states of health and disease; in short, let him read my philosophy of man, &c., and then let him be a disciple of Aristotle, of Plato, Descartes, Locke, Condillac, &c.!

Let us now return to our principal object, the importance of the anatomical and physiological study of the brain.

* Dictionnaire des Sciences Med. xxxix. p. 347.

In the more complicated animals of the higher orders, all the functions are more or less subordinate to the brain. A fluid effused within the brain, and all kinds of pressure upon this part, paralyzes, more or less, the whole body, and, in different degrees, extinguishes consciousness and the power of thought. The striking difference between the wounds of some animals, and those of man, is well known. Snails, lobsters, and lizards, not only endure the most severe wounds, but reproduce, even several times, parts that they have lost, such as the feet, eyes, and head. Tenacity of life diminishes in proportion as the brain becomes more complex. In animals, wounds are accompanied by such accidents only as are inseparable; in men, on the contrary, especially in persons whose brains are irritable, how often are the most trifling wounds followed by tetanus and trismus?

It may be assumed, that this irritability is strong in different individuals, in proportion as their brain is voluminous and active. In idiots, in paralytics, and generally in diseases where the cerebral sensations are blunted from any cause, this irritability frequently cannot be excited by the most powerful internal and external stimulants.

Reflect on the tumult which the affections and passions, whose immediate seat and original source is in the brain, excite in the whole man. Do we not behold chagrin, jealousy, envy, languor, home-sickness, misplaced affection, &c., devouring the principle of life? How often has not a too sudden transport of joy, violent fright, or anger, destroyed life as suddenly as a thunderbolt. Who does not know the power of imagination, of attention, and of confidence, in the production and cure of diseases, especially nervous diseases, such as epilepsy in many instances, and intermittent fevers? Those most grievous afflictions, melancholy, hypochondriasis, despair, a tendency to suicide, hysteria, nymphomania, all the mental alienations, with their influences on so many other parts of the body, have their principal and immediate causes

in derangement of the brain. What an index, consequently, is it, to the treatment of these sad maladies.

Volumes have been written on the reciprocal influence of the brain, and the viscera of the abdomen and chest. And in general, how great must be the utility of the pathological study of the brain, in diseases of infancy, in cerebral, atonic, adynamic fevers, in apoplexy, in inflammations of the brain, frequently so deceptive, and which, by the tremor, spontaneous vomiting, and depression of strength, simulate diseases of a totally opposite nature.

The instincts, the propensities, the sentiments, the intellectual faculties, the distinctive character of humanity, owe their existence and their modifications solely to the brain. Without a brain, there would be no perception, no sensation, no ideas, no enjoyment, no suffering, no individual consciousness. It must, therefore, be allowed, that without a brain, there could be neither psychology, nor any species of philosophy.

This study brings under our eyes the gradual scale of sensible beings. The sensible substance, quite pulpy in the polypi, is gradually gathered into nervous filaments, and into common trunks, in beings somewhat more elevated. To establish a more extended intercourse with the external world, nature has superadded apparatus just as complicated as the relations of the species demand. In this way, by the successive addition of new organs, always in proportion to the faculties, nature proceeds step by step, and, by superadded cerebral productions, at last arrives at man, the most complicated and the most noble of beings. By additions of cerebral substance alone, could the brain of any animal become that of a more perfect animal? and by mere subtracting from the same substance, could the intelligence of man be degraded to the simple faculties of the brute? Is there any more excellent method to analyze the complicated character of man, and to arrive, step by step, at a complete knowledge of him?

The physiology of the brain makes us acquainted with our entire dependence on the primitive laws of the creation ; the source of moral good and evil ; the cause of the diversity and of the opposition of our propensities ; of the strength or weakness of our understanding ; the internal motives of our will and of our actions. Instructors, moralists, legislators, and judges, cannot, with impunity, neglect the influence of the organization over our propensities, passions, and talents. It proves to them, that there is no certain quantum, either of the power of doing good, or of avoiding evil, or of the degree of moral liberty with which each individual is endowed. It therefore possesses a general interest for all intelligent classes of society.

It explains to us the modifications of our propensities and faculties at different ages, their successive and gradual development, their stationary state, their gradual decline down to the imbecility of old age ; and thus it shows us to what degree, and under what conditions, we are capable of apprehending the lessons of education and experience.

It explains to us not only the diversity of the moral and intellectual character of individuals, but it also gives us a reason for these differences in the two sexes, and in different nations : it indicates the source of their customs, of their manners, of their legislation, their mode of judging of what is virtuous and what is vicious or criminal, of their religion, of their barbarism or their civilization, of their institutions : thus it shows us how a uniform system of education, rewards, punishments, laws, &c., would be little in conformity with nature, whether as it regards different individuals, or different nations ; finally, it fixes our ideas, irrevocably, as to the unity of the human species.

Study the different developments of our cerebral parts, and you will no longer be deceived as to the prime motives which determine your tastes, and your actions ; you will judge exactly of your merit and your demerit ; you will know the reason, why it does not depend on

yourself, that you have such and such a predominant propensity or talent, to become a mathematician, a mechanic, a musician, a poet, or an orator ; you will comprehend why you excel, without effort, so to speak, in one thing, whilst in another you are inevitably doomed to mediocrity ; you will see, why he who is brilliant in a particular station, must necessarily be eclipsed in another. Finally, you will explain the double man within you, and the reason why your propensities and your intellect, or your propensities and your reason, are so often opposed to each other.

While you search out, in history, the lofty deeds of great men, if you would not be the dupe of their biographers, consult the organization of their head ; then will you be able to judge what belongs to them, and what to exterior influences and suggestions ; what they owe to chance and what to their own determinations ; how far we are to ascribe honor to their enterprises, or to their concerted intellectual plans, or to the energy of certain propensities.

The study of the physiology of the brain shows us the limits and the extent of the moral and intellectual kingdom of man. It shows us an immense disproportion between the elevated faculties, and the faculties of mediocrity ; and impels us to the result, that whenever man is governed by the multitude, whenever rules, decision and laws are made by a plurality of votes, there mediocrity domineers over genius. Propter peccata terræ, multi principes ejus.

Finally, the study of the functions of the brain overthrows an infinity of physiological and philosophical error, and terminates those endless and tedious discussions. It assigns to each organ, whether of automatic or animal life, its proper function. We no longer regard the external senses as the origin of our faculties. It is the brain, which receives their impressions and operates upon them, according to the nature and the degree of its inherent force. It is no longer the *signs* so much talked of by modern philosophers, which de-

~~why our understanding.~~ Signs have no value in regard to infants, to idiots, or to worn-out organs.— Signs, the language of speech, writing, the language of gesture or action, are creations of the brain, and are only understood, in proportion as they are addressed to pre-existing faculties. This is the reason why language changes from one individual to another, from nation to nation, from time to time, according as the internal conceptions change. Sooner or later there will be established an unbroken harmony between the internal man and his external products, between things and their expressions. Ere long it will no more be the physical which acts upon the moral, nor the moral which acts upon the physical; the result will be that certain affections will act either on the brain itself, or on other parts. Your understanding, your volition, your free will, your affection, your judgment, instinct, &c., will be no longer personified beings: they will be cerebral functions. You will no longer demand, what is the origin of the arts, sciences, war, civil institutions, religion, morality: God has revealed it all to you by means of your cerebral organization; and, finally, you will abandon to another tribunal, all questions in regard to the nature and seat of the soul, its reunion with the body, the mutual influence of spirit and matter, the unity of self, &c. &c. In a word, the philosophical physician and the physiologist, instead of sounding his course amid the straits of speculation, will march confidently along the route of observation.

We may, therefore, henceforth consider, under a much more eligible point of view, the whole nervous system, that part of the animal organization surpassing all others in importance. The laws of their origin, their successive reinforcements, their expansion, the supply of apparatus for the most varied functions, are discovered and reduced to a general principle. The nerves which preside over sensation, motion, the functions of the senses, originate and are developed according to the same laws as the organ of volition and thought.

How interesting and important is the study of the brain to become,—now that it is no longer condemned to be merely sliced, as a brute or unmeaning mass! This organ will henceforth present something more than simple ruins: we shall see it disposed throughout, for some grand purpose: every where will be discovered the means of reciprocal influence, notwithstanding the most astonishing diversity of function. All those ancient forms and those mechanical connections, are now transformed into a marvellous collection of apparatus for the moral and intellectual forces, in the same way that the action of different viscera, and the sensation of different senses are found to be subordinate to a particular nervous apparatus; in the same way also, each instinct, each propensity, each faculty in man and animals, is found to be subordinate to some part of the nervous substance of the brain. If, therefore, the mind cannot be apprehended by us, we may detect it in those organs, which mark the measure of the intelligence of each individual and each species. The organs establish, not only the line of demarcation, between man and the brute, by indicating the degree of their faculties by the degree of their development; they teach us also how nature prepares a man to make of him, a sage or a fool, an artizan or a poet, a despot or a slave.

The time will soon come, when, convinced by evidence, all will agree with Bonnet, Herder, Cabanis, Prochaska, Scemmering, Reil, &c., that all the phenomena of nature are based upon the organization in general, and that all the moral and intellectual phenomena are based upon the brain. A few drops of blood extravasated in the cavities of the brain, a few grains of opium, are enough to demonstrate to us, that, in this life, volition and thought are inseparable from cerebral organization. Whoever would not remain in complete ignorance of the resources which cause him to act; whoever would seize, at a single philosophical glance, the nature of man and animals, and their relations to external objects; whoever would establish, on the intellectual and moral

functions, a solid doctrine of mental diseases, of the general and governing influence of the brain in the states of health and disease, should know, that it is indispensable, that the study of the organization of the brain should march side by side with that of its functions.

Thus the naturalist, the teacher, the moralist, the legislator, always fluctuating and undecided as to the true causes of the propensities and passions of man, of his talents and their difference, may rectify his ideas, and become satisfied, by sensible and evident proof, that the human organization is adapted to a superior order of the moral and intellectual forces ; that the degree of moral liberty, of merit and of demerit, is as different in individuals as their cerebral organization is different ; and, consequently, that education, morals, religion, legislation, rewards and punishments, are essentially allied to the nature of man.

OF THE FUNCTIONS OF THE BRAIN, AND OF ITS PARTS.

SECTION I.

OF THE FUNCTIONS OF THE BRAIN IN GENERAL, OR, OF THE ORGAN OF THE SOUL.

IN my first volume, I have proved, that the intellectual and moral dispositions are innate, and that their manifestation, in this life, is impossible, without the intervention of material instruments. This being laid down, every one will inquire, Do these materials, considered collectively, constitute the organization, or is it some particular portion which serves as the organ of the soul ? and in this latter case, what is that portion ?

The reader will remember, that he is not to confound the expression, *organ of the soul*, with the expression, *seat of the soul*; and he is not to expect, that I shall engage in the examination of the question, In what manner do the soul and body reciprocally act on each other? I shall rest contented with stating the opinions of some ancient and modern authors on this point.

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seat of the soul, and sometimes of the *organ of the soul*; and think that it is absurd to seek for its seat in any one of the parts just named, because there is no one of them that has not been found vitiated or destroyed, without a loss of the faculties of the soul ensuing upon such injury. Unzer, Jacobi, Dumas, and others, think that the arguments, brought against those who pretend that the brain is the seat of the soul, are absolutely unanswerable. They appeal particularly to the observations of Bartholini, Duverney, and others, who pretend to have dissected subjects, in whom the brain had been entirely destroyed, or even of children without a brain, while the faculties of the brain did not fail to manifest themselves. Dumas cites especially the observations of Meri, Weffler, and others, who saw infants, born absolutely without any brain, live for some length of time ; Dumas adds, that the encephalon being insensible itself, cannot be the seat of the soul.

Most authors denounce the hypothesis that the seat of the soul is endowed with extent. A seat of the soul which should not be a point, would appear to them incompatible with its simplicity. This point, it seems to them, should be that from whence all the nerves of the body originate, or towards which they all tend. But, unfortunately, they are obliged to admit that there exists nowhere, any point from whence all the nerves spring, and none in which they all come together. Moreover, even if such a point did exist, it must always be a physical point, that is to say, it must have extent, and in this case there would be nothing gained by the idea that the soul is simple.

The opinions relative to the action of the soul upon the body, and *vice versa*, are quite as much at variance, and quite as absurd. Some think they elude all difficulties, by confining themselves to the spiritual world, and constituting God himself as intermediate between the soul and the body, according to Malebranche. The soul, say they, having no parts, can never be found in contact with any body. Others think, we may conceive

View of the most noted opinions on the seat of the soul, and on the reciprocal action of the soul on the body, and the body on the soul.

Physiologists and philosophers, according to the idea they form of the soul, represent it as acting in this or that manner, upon this or that point of the animal organization. Those who, with Stahl and his school, understood the soul to be the motive force of growth, of irritability, and of life, were necessarily obliged to admit that it was expanded, or in a manner diffused throughout all parts of the body. Those, also, who supposed there was an immediate sensitive faculty in other parts than the brain, were obliged to admit a seat for the soul somewhat extended.

From the earliest periods down to our own time, the sensual faculty has been pretty generally placed in the chest and abdomen. Pythagoras, Plato, Galen, and many others, sought for the seat of the sensitive soul in the brain : the Stoicks and Aristotle sought for it in the heart ; Erasistratus in the meninges ; Herophilus in the large ventricles of the brain ; Servetto in the *aqueduct of Sylvius* ; Auranti, in the third ventricle of the brain ; Van Helmont in the stomach ; Descartes in the pineal gland ; Varthon and Schellhammer at the origin of the spinal marrow ; Drelincourt and others, in the cerebellum ; Bonteköe, Lancisi and Lapeyronie in the corpus callosum ; or in the great commissure of the brain ; Willis in the corpora striata ; Vieussens in the centrum ovale of the medullary substance which bears his name ; Ackermann in the part which that anatomist calls *Sinneshügel*.* Other physiologists speak sometimes of the

* *Sinneshügel*, is a German word, which signifies *tubercle of the senses*. Ackermann includes, under this denomination, the optic thalami, and the corpora striata ; because, according to the received opinion, the optic nerves arise from the optic thalami, and the olfactory nerves from the corpora striata.

seat of the soul, and sometimes of the *organ of the soul*; and think that it is absurd to seek for its seat in any one of the parts just named, because there is no one of them that has not been found vitiated or destroyed, without a loss of the faculties of the soul ensuing upon such injury. Unzer, Jacobi, Dumas, and others, think that the arguments, brought against those who pretend that the brain is the seat of the soul, are absolutely unanswerable. They appeal particularly to the observations of Bartholini, Duverney, and others, who pretend to have dissected subjects, in whom the brain had been entirely destroyed, or even of children without a brain, while the faculties of the brain did not fail to manifest themselves. Dumas cites especially the observations of Meri, Weffer, and others, who saw infants, born absolutely without any brain, live for some length of time ; Dumas adds, that the encephalon being insensible itself, cannot be the seat of the soul.

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of the influence of the soul upon the body, in the same manner as we conceive of the influence of God upon the universe. They admit that God has communicated to spirits, to angels, and to other animated beings, a part of the faculty which he himself possesses, of acting upon bodies, and of being affected by bodies.

Some philosophers treated these ideas as chimerical, and attempted to give a more natural explanation. They confine themselves entirely to the physical world, deny the existence of two substances essentially distinct, and regard it as superfluous, to look for any thing intermediate between the body and the soul. They declare, that what are called faculties of the soul, are merely properties of the corporeal, constituent parts, a result of the mode of aggregation of these parts. In the same way as the future properties of the tree are latent in the germ, and do not appear till after the development of the germ, so, say they, all the primitive forces lie dormant, in the semen of living beings, and their action is only rendered possible by the increase and development of the animal.

A third class of philosophers took a middle route ; they thought the problem would be solved, if they could find something intermediate which should effectuate the union of soul and body, and cause their reciprocal influence. They exercised all their sagacity to find a substance, as little material as possible, which should approach to the nature of spirit, and which should occupy a middle place between the soul and body. They imagined a very subtle soul, susceptible of sensation, susceptible of impressing motion, but still material, capable of communicating immediately to the spiritual soul the impressions it had received, and which the spiritual soul might charge with transmitting to the body its will. Hence all those subtle vapors, those attenuated substances, such as the pneuma, caloric, light, animal spirits, electric, magnetic and galvanic fluids, a current of animal magnetism, &c. were successively considered as the uniting bond between soul and body.

But, however subtle we may imagine these fluids, they are still material, and the difficulty of conceiving how two substances, of a nature essentially different, can act on each other, is not removed.

Kant despaired of ever seeing this knot untied by philosophers. He referred the question to the tribunal of the physicians and physiologists; but what can physicians and physiologists explain of the organization of the living body? Let the question be respecting the body alone, or respecting the soul alone, it will explain, at most, but the phenomena produced by the laws of motion and by chemical proportions. They never will explain life: they will never ascend back to primitive forces. It is a fact, that men of the greatest sagacity have failed, whenever they have attempted to go beyond phenomena and the conditions of those phenomena. We have no positive idea of any thing that it is not matter; consequently we can say nothing, either of the soul, or of its peculiar forces, or of its seat, or of the action of the soul on the body, or of the body on the soul. I shall, therefore, as I have hitherto done, confine myself exclusively to the investigation of the material conditions, with which the manifestation of the qualities and faculties of the soul becomes possible, or, what amounts to the same thing, determine what part of the body it is proper to consider as the organ of the moral and intellectual faculties.

Is it expedient, in the present state of our knowledge in physiology, to continue to make researches as to the organ of the soul?

Philosophers, physiologists and physicians have for a long time maintained, that the brain is the organ of the soul. It might, therefore, appear superfluous to continue researches on this subject. It is one thing to recount opinions which have been ventured and adopted for the moment, and another to develop a truth in all its ex-

tent, and to attach it to science in all its relations. Hippocrates, in his day, thought that the brain is the organ of the soul, but he was so little sure of the truth of his assertion, that he sometimes attributed the functions of the soul to the diaphragm, and sometimes to the heart. The same uncertainty has always obtained. In modern times theorists agree with the ancient philosophers in establishing the seat of the intellectual faculties in the brain ; and the appetites and moral affections, they, with MM. Cabanis, Broussais, Begin, and Delpit, place in the viscera of the chest and abdomen. It is said, that, in truth, we have the consciousness of our passions, propensities, and affections in the brain, but that they originate in other viscera. They seek, with Reil and others, for the seat of the affections and passions in the nervous plexuses, and in the ganglia of the chest and abdomen. According to Dumas and MM. Richerand and Sprengel, and according to all physiologists and philosophers, without exception, the difference of the intellectual faculties and the moral qualities, depends on the difference of temperaments. It is maintained, that the brain participates no more in the functions of the soul, than the rest of the body does. MM. Pinel, Esquirol, and Fodéré did not presume to seek in the brain for the cause of mania, insanity and imbecility. Astruc, M. Rudolphi, and a hundred others, with them, regard the brain as an inorganic mass. Bichat regarded it as a simple envelop, destined to protect from injury the parts which are found beneath it. MM. Sabatier, Boyer, and Darwin regarded the brain as a purely secretory organ. All anatomists, hitherto, have considered it as the common origin of the nerves. It is very generally maintained, that our sensations and our ideas have no other sources than the external senses. The attempt has been made by Buffon, George Le Roi, Vicq d' Azyr, M. Cuvier, and others, to deduce instinct, or mechanical aptitude, from the tail of a beaver, the trunk of the elephant, the eye, the ear, the hand. Some also, with Stahl, Kessler, and others, teach that the soul

is expanded throughout all the nerves, not only as to its action, but as to its substance, and that thus the whole body becomes the organ of the soul. So great is the credulity on this subject, that experiments in animal magnetism have been undertaken, with the intention of proving that all the nerves are endowed with the same force ; so much so, that not only may each one replace another, but that each one may supply the place of the brain. In artificial somnambulism the soul is disengaged from the trammels of the body, so as to cause it to exercise its faculties with a greater freedom. A universal soul of the world is also dreamt of, which acts in our organization, without being dependent on any thing in the corporeal world. Metaphysicians make it their pride, that the two superior faculties, reason and volition at least, act independently of all matter. It is in fact advanced, that the intellectual and moral faculties subsist, even after the brain is dissolved, reduced to pus, or ossified ; were not MM. Berard, de Montegrè,* Richerand, Halle, Sprengel, Tupper, &c. &c., assured "that all the functions of animal life, continue to subsist for a time, after all the parts of the brain have been successfully destroyed," &c. &c., can it besaid after this, that the question, as to the organ of the soul, has been decided by physicians and physiologists ? In the course of this work, we shall see, that there is scarcely an author, who has not fallen into some of the contradictions which I have mentioned. Those even who have formed the most clear ideas on the subjects which they treat, have rarely supposed that our propensities, physical love, pride, &c., had each their proper organ in the brain. The intellectual faculties alone appeared to depend on the encephalon. It is, therefore, necessary to examine again the doctrine of the *organ of the soul*, in all its aspects, and to assign to the brain its true sphere of activity.

* *Dictionnaire des Sciences Médicales*, vol. vii. p. 318.

Of the functions which are usually attributed to the brain.

In order to prepare the reader for the examination of the question, *In what sense is the brain the organ of the soul*, I should commence by enumerating the functions which are usually attributed to the soul, and by distinguishing them from such as are maintained without its participation.

All phenomena which take place either in plants or animals, and are unattended by sensation, perception, consciousness, or the feeling of their own existence, are phenomena of organic, automatic, vegetative life. Fructification, development, growth, nutrition, the secretions, &c., are functions of life purely organic, automatic, vegetative.*

The first phenomenon of animal life, is the perception of impressions which come either from without or from within. The faculty of perceiving irritability is the least elevated of all. It is common to all the nervous system, at least, inasmuch as the nerves perform the office of conductors for the brain ; and in each one of these systems, it is differently modified.

The faculty of voluntary motion with reaction, with consciousness, occupies the second place in the order of the functions of animal life. Physiologists have been wrong in giving the name of voluntary motions to movements of the automatic life, such as the peristaltic motion, the systole and diastole.

The functions of the five senses occupy the third rank in the functions of animal life.

The most elevated rank belongs to the appetites, the instincts, the mechanical aptitude, the propensities, the affections, the passions, the desires, the will, to the in-

* Vide vol. i. section 3. Difference of automatic and animal life.

tellectual and all other faculties ; in short, to all that pertains to the intellectual faculties and to the moral qualities.

All the functions, therefore, which are accompanied by consciousness, and by perception, the most simple sensation as well as the most complicated operation of the understanding, come within the sphere of action of animal life, and should be considered as phenomena in which the soul or the brain more or less participates.*

May the brain be considered as the organ of all the operations of animal life ?

Under the denomination of the brain, or encephalon, I do not include either the spinal marrow, or the nerves of the senses : taking the expression brain or encephalon in this restricted sense, I would ask whether we are authorized to maintain, with M. Sæmmering, that the brain is the part of the body where is produced the consciousness, or the sensation, as well of the objects which exist within the body itself, as of external objects ; that is to say, the part where all the sensations arrive, are retained and compared, and where all voluntary motion originates ; or rather, whether the brain is the exclusive instrument of all sensation, all thought, and all volition ? Very good reasons may be alleged in favor of this opinion ; and it may be combated by reasons perhaps equally good. As our knowledge is yet too limited to pronounce final judgment, I shall rest satisfied with presenting the arguments for and against, and leave to the reader the task of deciding.

* Difference between automatic life, and animal life, vol. i.

Reasons which seem to prove, that the brain is the organ of all the sensations and all the voluntary motions.

Haller* and M. Sæmmering† prove, by the following arguments, that consciousness does not take place at the point where an object touches the nerve, that is to say, where the impression is made; but that sensation takes place in the brain.

1. A nerve, when pressed upon, enclosed in a ligature, or divided, loses the faculty of exciting sensations; that is to say, the impression made by the object is not transmitted by a nerve thus modified: we may irritate the nerve below the injury or the ligature, without producing any sensation, without the subject on whom we make our experiment feeling any pain. But why is the nerve insensible below the ligature, if sensation may be produced without communication with the brain?

2. The same phenomenon occurs, when the nerve is injured or compressed at its origin. Compression of the origin of the olfactory nerve produces loss of power of smelling; compression of the optic nerve produces blindness; compression of the auditory nerve, deafness; compression of the digital nerve, insensibility of the finger. This paralysis ceases the moment the pressure is removed. A person received a wound which penetrated to the corpus callosum, and whenever pus accumulated, he lost the use of the eye of the side opposite; and this blindness disappeared the moment the pus was discharged; therefore, the sensation of sight takes place in the brain.

3. Compression of the encephalon by an effusion of blood, lymph, pus, by an exostosis, by the simple turges-

* Physiologie, vol. iv. § 16.

† Sæmmering, Lehre vom Gehirn, und von den Nerven, p. 373, § 306.

cence of the blood-vessels, and even a mere concussion, may bring on a loss of the exercise of the senses ; therefore, the nerves take their origin in the brain, though the nerves of these senses may be in a state of perfect integrity. The moment the pressure on the brain ceases, the senses resume their activity.

4. Sometimes pain is distinctly felt to proceed along the nerves up to the brain.

5. The pains, which thus pass up from the wound of a limb, may sometimes be intercepted by a ligature.

6. Persons who have lost a limb, think, even after they are healed, that they can still feel the pain in the limb, at the spot where it was diseased. This pain can have no other seat than the brain.

7. It frequently happens, that certain impressions remain permanent in the brain during life ; yet, when the encephalon suffers a sudden pressure, or some other lesion, they seem to disappear suddenly, and this pressure having ceased, they reappear with equal promptness ; but since they have been preserved in the brain, they must, of course, have come there.

The voluntary motions of the muscles, produced with consciousness, commence in the brain, or are produced by means of the nerves as they depart from the brain. The following are the proofs.

We find ourselves unable to move a certain muscle when the functions of the brain are checked by pressure, effusions, &c.

When the brain is irritated by a splinter, convulsions are produced, which cease as soon as it is withdrawn.

As the brain alone is the seat of thought, the motions produced by thought must be derived from it. If the cause of voluntary motion existed in the same parts which execute it, each motion should exist after the destruction of the brain ; they need not be augmented when this organ is irritated, nor be suppressed by its compression.

These arguments of Haller and Sœmmering have

induced me to advance the following propositions :* *That the perceptions and consciousness exist only in the brain ; that without the brain no impression from external objects and no impression originating within, can produce sensation ; that the brain is exclusively the organ of the functions of animal life ; that all the phenomena which are presented to us by Zoophytes, all those which we observe in the different nervous systems of the brain, are not to be regarded as phenomena derived from the sensitive faculty, and from animal spontaneity, but must be ascribed solely to irritability.*

To appreciate the assertion, that all the sensations and all the voluntary motions have their seat and point of departure in the brain, it has been hitherto alleged, that the nerves are *merely a continuation* or a prolongation of the encephalon, that they all spring from the brain, or all converge towards the brain, as to a common centre. But this argument comes to nought, since I have proved, that the nerves of the organs of the senses, and the medulla oblongata are not a prolongation of the encephalon ; that each particular nervous system is an independent system ; and that the communicating branches, which unite these systems to each other, are sufficient to explain the reciprocal influence which they exercise upon each other.†

Objections, and answers to those objections.

Dumas maintains, as I have already said, that the brain is to be as little regarded the organ of the sensations, as the seat of the soul ; since it is itself insensible. It is true that, by mutilating the brain, we do not excite pain nearly so acute, as when we pull or pinch the nerves, or exercise any violence upon them. But there is a state

* Vol. i.

† See volume first of my large work.

of disease when the brain becomes very painful, and in this it is analogous to many other parts, which never are subject to pain except in a state of disease. Moreover, we must not lose sight of the fact, that each part, each viscus, each sense, is capable of exciting a peculiar sensation in us. To have the sensation of hunger, by means of the stomach, is a different thing from feeling hope or pity. We indisputably are conscious of our wishes and of our thoughts. But no one disputes, that volition and thought have their seat in the brain; it cannot therefore be denied, that the brain causes us to have sensations peculiar to itself.

Dumas and Richerand reject, also, the argument above, drawn from the fact, that pain is felt in amputated limbs. According to them, these pains are merely the remembrance of the pains which have been formerly endured in that part. But I have heretofore, in another place, proposed the questions,—*How is it that, by all the powers of volition, one cannot recall these pains? How happens it, on the contrary, that by a mere lapse of time, one finds himself assailed, as it were, unawares?* That there are monsters born without brain, who nevertheless live a considerable time after birth, and make different movements, proves nothing at all against the assertion, that the brain is the seat of all the sensations, and of all the voluntary movements. In adducing these, the phenomena of life purely automatic, are manifestly confounded with those of animal life.

The same may be said of the argument of Gautier † that a cock, when beheaded, darts forward and flaps his wings, to avenge himself of his enemy; and also of that of Gallois, who pretends that the fluttering of the feet of decapitated Guinea pigs and rabbits, are movements which these animals make to scratch themselves.

* Nouveaux Elements de Physiologie de Richerand, 7 ed. t. ii. p. 181, 182.
† Haller, Physiol. vol. iv. p. 363.

Insects and the amphibia lay eggs after they have been beheaded: similar phenomena are observed in the muscles and viscera of more perfect animals, when the body is operated upon immediately after their death, and irritability is reanimated by artificial means, after the natural movements have entirely ceased. The intestines continue their movements for a long time after death, and it is not uncommon that the uterus, by means of automatic contractions, expels the fœtus.

All these movements seem not to be accompanied by sensation or volition, except in consequence of the mechanism which executes them. They take place very much in the same way, as when feeling accompanies them, and volition commands them. They prove but one thing, which is, that automatic movements and automatic spontaneity do not require the existence of the brain. It is for this reason, also, that neither the intensity nor the duration of life is in proportion with the mass of the brain.

Although Haller and Sœmmering have endeavored, by the arguments above, to establish that the brain is exclusively the organ of the sensations, of consciousness, and of voluntary motions, they regarded it as possible that children born without brain, properly so called, and having only the nerves of the senses and parts of the face developed, had cried and had taken the breast. But, as Haller and Sœmmering teach that the olfactory nerves arise from the corpora striata, and the optic nerves from the optic thalami, these physiologists supposed the existence of a very considerable cerebral mass, in the children of which they spoke, and under this aspect their observations prove nothing against the necessity of the presence of the brain.* In

* Denkschriften der K. Acad. d'Wissensch, zu Munchen, für das Jahr, 1808, §. Th. Sämmering. Academicæ Annotationes, de Cerebri administrationibus anatomicis, vasorumque ejus habitu, p. 73, § 17.

Ad functiones cerebri ulterius cognoscendas monstrorum, tam mortuorum quam viventium considerationem nullo modo neglexisse physi-

general, I would not credit any similar observation, so long as I was not sure, that its author decided upon it, after a full and entire investigation of the case. I have had occasion to examine an acephalous child, born dead. The parietal bones were so much flattened down upon the sphenoid and the petrous portions of the temporal bones, that it was impossible for me to discover the least trace of brain within the cranium. I found, however, the olfactory nerves, the optic nerves, and the auditory nerves, which were much elongated and very distinct. These nerves communicated with a sac of a fleshy appearance, two and a half inches in length, attached to the nape of the neck. When I opened the skin of this sac, I found most distinct convolutions; consequently, I had before my eyes the brain.[†]

But others go much farther than Haller and Scämmering. They pretend that tortoises, after the brain has been all taken out, will continue to eat, and even to copulate. They cite Duverney, who says that the whole brain of a pigeon being removed, the pigeon still continued all its functions, the same as if nothing had happened.

"It is very certain," says Le Gallois, "that birds continue to live for a considerable time, and even to walk and run after their head has been cut off. The practice of the emperor Commodus has been frequently cited in illustration of this, who, while the ostriches

ologos, satis inter alia demonstrant descriptiones innumerae exemplorum illorum, frequentissimorum, quibus constat, etiam toto cerebro et medulla spinali deficiente fetus non modo vegetos et pingues nasci, sed etiam natos vivere, vociferare et sugere, per aliquot horarum spatium, *manifesto arguento; cerebrum et medullam spinalem ne ad nervorum incrementum et nutrimentum quidem, nedum ad vitam alendam necessaria esse.

* Confer egregiam monographiam *Ed. Sandifort*; *Descriptio infantis cerebro destituti*, L. B. 784. Exemplis a viro clarissimo allegatis recentiora addidi in *Abbildungen und Beschreibungen einiger Misgeburten*, Frankfort, 1791.

[†] This brain weighed an ounce and three and a half drams.

were running round the circus, amused himself by shooting off their heads with crescent-shaped arrows : these animals, after their heads were off, continued their course as before, and did not stop till they had arrived at the end of the course."

Many physiologists have obtained the same result of decapitating turkeys, cocks, ducks, pigeons, &c.* Authors assure us, that after decapitation a calf has continued to walk a long distance : that a woman has proceeded several steps : that a man has been able to hold his sabre and brandish it three times : that another struck his chest with both hands."†

Now let us see what Le Gallois has learnt from all these miracles.

He says, in his preface, "But I am far from pretending, that it has not an influence equally great and necessary, over the other parts of the body. I grant, on the contrary, that it is this which *determines* and which *regulates* all the acts of the animal functions. For example, when I move my arm, *the principle of this movement emanates from the spinal marrow*, and not from the brain ; but it is the brain which has willed the movement, and it is that, which directs it in a proper manner to effect the object which I designed. Cold-blooded animals furnish an evident proof of what I here advance. When a salamander is decapitated at the first vertebra, it may continue to live several days, and although it moves the body with force sufficient to transport it from place to place, yet it remains stationary, and we may leave it upon a plate, with a little water, without any fear that it will escape. If we examine the motions which it makes, we shall see that they are all irregular and without design. It moves its feet in contrary directions, in such a way that it cannot advance, or, if it makes one step forward, it soon makes another

* *Expériences sur les principes de la Vie*, p. 7, 8 and 9.

† *Avant-propos de l' ouvrage ci-dessus*, p. 3 and 4.

backwards. The same thing is observed in decapitated frogs ; they can no longer leap, or, if they make a few leaps, it is only when their hinder legs meet with some point of resistance. If they be placed upon the back, they now and then attempt to change their position, but there they remain, because they no longer know how to execute the motions necessary to replace them upon the belly.”* How shall we reconcile these observations of Le Gallois and the facts which he, with so much complacency, before cites ?

In another place, this physiologist says,—“It may happen that reptiles are able to govern their movements after being decapitated ; but, if we take notice, we shall find that in all such cases the decapitation has been only partial ; that it has been made through the cranium, and that the posterior part of the brain remains united to the body.”† But immediately after, he affirms, “that sensation and voluntary motion may subsist and be kept up by artificial respiration in a decapitated (cold-blooded) animal ; ‡ that it is not merely the internal functions that subsist (in acephalous foetuses,) but a part of the animal functions subsist there also, since voluntary motions take place.”§ The whole work on the principle of life, then, notwithstanding the eulogium the gentlemen of the committee of the first class of the Institute bestow upon it, is merely a tissue of vague and contradictory ideas, in which the author is perpetually confounding phenomena due simply to vegetative life with those of animal life ; where he constantly errs by attributing to sensibility, that which is merely in the effect of irritability, &c. How can we expect that experiments of this kind, which, repeated by other hands, uniformly furnish different results, should ever lead to truth ? ||

* Avant-propos, p. 3, 4.

† Avant-propos, p. 6.

‡ Avant-propos, p. 7.

§ Body of the work, p. 16.

|| These experiments of Le Gallois, which might most easily confound the effects of irritability with those of sensibility, have only succeeded on animals brought into the world in so imperfect a state, as to enjoy scarcely any thing but a vegetative life. Le Gallois acknowledges, that the same experiments would not succeed on animals born into the world more perfect.

The observations of Darwin have the same defect, and are, consequently, as little decisive. This physiologist maintains, that the fœtuses of animals have sensations, and are capable of voluntary motions; that they undergo hunger, and open and close the mouth or bill; that they swallow a part of the fluid which surrounds them; that they lick themselves and swallow many hairs; that they even attempt to walk and jump.*

But, supposing the existence of all these phenomena were demonstrated, it by no means follows that they are not produced by means of the brain; for, although the brain, even for some time after birth, may not be capable of exercising the superior functions, those parts of it which are destined to the exercise of the inferior functions, may yet be sufficiently developed, even before birth. Do we not see that some animals, for instance, colts, calves, chickens, &c., have, at the moment of birth, the brain and organs of the senses so developed, that they are capable of functions much more exalted than deglutition and voluntary motions?

As the experiments I have cited presented so many contradictions, M. Spurzheim determined to perform similar mutilations in my presence.

If we remove the greater part of both hemispheres of the brain, in pigeons and hens, and make a noise, these animals manifest distinctly, that they still see and hear. In our experiments, no one of these mutilated animals would eat without aid; but when bread or any other food was introduced into the bill, they swallowed it very well. Rabbits, which we have mutilated in the same manner, also saw and heard; they ran hither and thither, and even took food without assistance. But in these cases neither the cerebellum nor the whole of the brain was extracted. Whenever the lesion penetrates to the base of the brain, or whenever the attempt is

* Zoonomie; ou les Lois de la Vie organique, par *Erasme Darwin*, traduit de l' Anglais par J. F. Kluskens, t. i. sect. xvi. ii. p. 231—33.

made to extract the cerebellum, the animal dies upon the spot, and the destruction of the nerves of sense is inevitable.

From these experiments we cannot avoid the conclusion, that the whole brain is not requisite in order that voluntary motions should take place, and that the organs of the senses should perform their functions. But we cannot decide, by experiments instituted for the purpose, whether any particular portion of the brain, properly so called, is necessary for the production of voluntary motions, or in order for the organs of the senses to act, nor what part of the brain is indispensable for such purposes.

We may, therefore, take for granted, that all those pretended experiments on decapitated animals, which continued to manifest sensibility and which still made some voluntary motions, were suggested by a puerile propensity for singular results; that they did not actually take place, but were built by the imagination on false premises.

I have, however, strong reasons for suspecting that nervous systems which do not belong to the brain, and without its intervention, may perceive impressions, that is to say, have consciousness, may retain the remembrance of impressions received, and that they are capable of animal spontaneity.

Reasons which seem to prove that other nervous systems, entirely independent of the brain, may also produce sensation and voluntary motion.

1. There are animals in whom we cannot, without closing our eyes to evidence, deny the existence of voluntary motion, the sense of touch and that of taste, although we can discover in them nothing which can be compared to a brain; for, it is only because of a distant resemblance, that some anatomists have called the scattered ganglions of these species, little brains.

But these animals feel hunger, seize upon their prey, and eat ; and, since they have no brain, it follows, that in them the sensations have their seat in other nerves.

2. Every nerve destined for any particular function, as well as the brain itself, has its peculiar origin, its particular apparatus for reinforcement, its final expansion ; and forms, of itself, a peculiar whole. Why should not such a nerve form a whole also, in respect to its destination ? Why should it not embrace a sphere of activity peculiar to itself ? It is pretended, that a complete division of continuity of the spinal marrow has been seen, without the parts below the lesion being paralyzed in consequence. This would seem to afford proof in favor of my assertion. Dessault reports one such case, and I have somewhere read of another.

3. Supposing that the functions of the nerves of the organs of sense were exercised only in the brain, and that these nerves do nothing but receive impressions from without, this would be to assign to an organ, which has already its functions to perform, another office still, for which nature would have formed peculiar apparatus to no purpose. Under such an hypothesis, it would have been sufficient that the external organs of the senses, the eye, for example, should have been placed in communication with the brain in the simplest possible manner. In this case, it would only have been necessary to conduct external impressions to the mass of the brain, in order to determine, in it, the operation from which results the sensation of taste, colors, sounds, &c.

4. The perfect manner in which nervous systems, different from the encephalon, perform their functions, depends in no wise on the greater or less mass of the brain, but on the more or less perfect structure of their own organization. Do we not see some insects endowed with a touch, a hearing, a taste, extremely delicate, although their brain is very simple and very small ? How indefatigable is the activity of these organs of sense in insects and in some fishes ! Is not the eye of the eagle, which has a small brain, but a large optic

nerve, more piercing than that of the dog, whose brain is much larger, but whose optic nerve is much smaller? Has not the dog a more acute smell than man, whose cerebral mass is at least ten times as great? Idiots and deranged persons often enjoy voluntary motion and the functions of the sense, in the highest degree. May we not be permitted to conclude from these facts, that the mode of action of each sense, of each nerve, destined for voluntary motion, is circumscribed within that nerve, in that sense, and that the brain has no other part in this action than to receive the impressions and to elaborate them for other purposes? or must we infer that in the more perfect animals, certain parts of the brain are destined to receive external impressions and to react upon them, and that other parts are destined for more elevated functions?

5. Some physiologists have observed that, when a sense is entirely destroyed, for example, by atrophy, that is to say, when not only the external organ has ceased to exist, but its whole nervous apparatus is annihilated,—they pretend to have observed, I say, that, in this case, all the ideas which depend on that sense are also lost, and that their reproduction becomes impossible. May we not conclude from this observation, that the impressions received by this sense, are retained by it alone, and that the remembrance of these impressions is produced by it alone?

The course of this phenomenon seems to justify my supposition. Persons who accidentally lose their sight, are at first inconsolable; the remembrance of ideas transmitted to them by sight is still recent, but by degrees they become reconciled, in part, undoubtedly, because they become accustomed to their misfortune; but, probably also, partly because the organ of sight becoming more and more feeble, the ideas which are gained by it, become enfeebled in the same proportion. When, at length, the organ is entirely destroyed, the impressions which depend upon it are equally annihilated, and

even the remembrance of these impressions becomes impossible.*

Darwin quotes the following examples: "A man nearly sixty years old, became deaf at about thirty. He appeared to be very intelligent, and amused himself with reading and conversation, by writing or by making signs with his fingers to represent letters. I observed that he had forgotten the pronunciation of his language so far, that when he attempted to speak, he articulated no word distinctly. His relatives, however, could sometimes understand what he would say. He told me, that in his dreams, he always imagined that people conversed with him by writing or by signs, and no one ever appeared to speak to him. Hence it would seem that with the perception of sounds, he had also lost the idea of the sounds themselves, although the organs of speech had still preserved a feeble remainder of their ordinary habit of articulating."

"This observation may cast some light on the medical treatment of the deaf; for we may assure ourselves by their dreams, whether the auditory nerves is paralyzed or not, or whether their deafness arises from some fault in the external organ."

"The most frequent causes of blindness are occasioned by defects of the external organ, as in cases of cataract and opacity of the cornea. I had occasion to converse with two men who had been blind for some years. One was affected with complete amaurosis; the other had lost the whole substance of his eyes. Both told me, that they never remembered having dreamed of visible objects, after they became totally blind."† I myself am knowing to similar facts.

* M. Scämmering had already advanced this opinion in 1784, in the eleventh number des Hessische Beyträge zur Gelehrsamkeit und Kunst; and he again brought it up (in 1800,) in his work entitled *Hirn und Nerven-lehre*, § 316.

† *Zoonomie de Darwin*, § iv. p. 33 and 34.

These are new reasons why I have always maintained in my public lectures, although these ideas were in opposition to the received ideas of philosophers, that each organ of the senses has, at least in the inferior animals, its peculiar faculty of receiving, and even of perceiving impressions, its own consciousness, and its own peculiar faculty of reminiscence. This same opinion, contested by others, is also found in the works of Cabanis. The solution of this problem demands more exact and more multiplied experiments.

But how shall we explain it, that in the perfect animals, a nerve accidentally pressed upon, compressed by a ligature, or divided, loses all sensibility in the part which is insulated from the brain? And how is it that a pressure which operates on the whole brain, suddenly interrupts the functions of all the senses?

Do the functions of the nervous systems in the perfect animals, demand a simultaneous action, at least, of those parts of the brain situated near its base, as the circulation of the blood demands the action of the heart; whilst in the imperfect animals, the sensations, voluntary motions, and the action of the organs of the senses, take place without the concurrence of a brain, precisely, as in these same animals, and in plants, there exists a kind of circulation without the concurrence of a heart?

Vegetables and zoophytes live without a nervous system, and are produced by buds. Other animals live with nerves, but without a brain. In general, in proportion as the organization becomes more complicated, and the organs more developed, and more adapted to more extended functions, the simultaneous concourse of each organ becomes more important to the preservation of life. In proportion as the brain becomes more compound, it also acquires a more extended influence over the rest of the organization, until, in the most perfect animals, all the other organs live under its influence, and it becomes indispensable to the existence of the individual.

So long as we cannot fix with exactness, as well in plants as in animals, the limits between the phenomena

of irritability, and those of sensibility, the explanation of their phenomena will always remain more or less conjectural. When we see, on the one hand, the greatest men considering the brain as the only organ of sensation and volition, in a word, of the whole animal life, whilst others believe themselves authorized to ascribe to plants sensation, the recognition of heat, cold and light, the passion of love, volition, a *sensorium commune*, the faculty of memory, dreams, the idea in short, as well of external objects, as of their own existence,* how can we hope to reconcile opinions so diverse?

Happily, it is of no consequence to the object I have in view, whether these difficulties are solved or not. I therefore abandon the subject, and pass to a more important question, and one which presents no insoluble difficulties.

Can the brain be considered exclusively as the organ of the intellectual and moral qualities?

The better to investigate this question, I shall begin by proving, that it is impossible to attribute the intellectual faculties and moral qualities to particular parts of the brain. This deduction will lead me to establish, that we must recognize the brain as in fact exclusively the organ of the intellectual faculties and moral qualities.

Negative Proofs.

We cannot look for the material condition of the intellectual faculties and moral qualities in any other part of the body than the brain.

If we except, for a moment, the different nervous systems, there is no part of the body which is organized in

* Zoonomie de Darwin, t. i. § 13.

such a manner, that we can believe it proper for discharging the superior functions, or for producing instincts, mechanical aptitudes, passions, faculties, volition, reason. Who would ever attribute such functions to the bones, ligaments, membranes, muscles, cellular tissue, blood-vessels, glands, &c.?

In accordance with the received opinion, one might be tempted to regard the heart as the seat of the moral qualities or vices, such as gentleness, generosity, courage, cruelty, &c. But, as soon as it is known that the heart is merely a muscle constructed with admirable art, composed of cavities, valves, an affinity of small muscles and small tendons, which cross each other in a thousand different ways, so soon as we are not ignorant that the heart is the principal instrument of the circulation of the blood, this idea falls of itself.*

Some physiologists would attribute to the diaphragm, the honor of the superior function; but the diaphragm, also, is nothing but a tendinous muscle, whose functions are appropriated to the chest and abdomen.

A poetical physiologist has dreamed, that the liver was composed of two substances, similar to those which compose the brain. In consequence of this idea, he found the liver, in its healthy state, very proper to be the organ of reason, and, in a diseased state, the organ of insanity. The principal function of the liver is manifestly the secretion of bile; and it is difficult to imagine that this fluid should be intermediate between the soul and the body.

* M. Richerand considers courage as the moral function of the heart. He thus expresses himself on the subject: "The heart is larger, stronger, and more robust in courageous animals, than in the weak and timid species." "It will be objected, perhaps, that certain animals, such as the turkey and the ostrich, are less courageous than the smallest bird of prey; that the ox is less so than the lion and many other carnivora. We do not speak here of the absolute volume of the heart, but of its relative magnitude. Now, although the heart of the sparrow-hawk is absolutely smaller than that of the turkey, it is much larger in proportion to the other parts of the animal." *Nouveaux Eléments de Physiologie*, 7 ed. t. i. p. 322.

Many of the qualities which are attributed to the viscera, do not manifest themselves until a long time after the development of these viscera. The liver, the glands, &c., are developed in young animals, and in infants, a long time before the qualities or the faculties, which are attributed to them, manifest themselves; and these qualities and faculties do not necessarily undergo modifications, when the liver, glands, &c., become irritated, inflamed, ulcerated, &c.

Several passages in the Bible seem to favor the idea, that the kidneys and the heart are the source of the deepest thoughts and of the most secret designs. But *God trieth the reins*, may very well be supposed to signify only, that his omniscience penetrates into the interior of man. Besides, we have as little reason to look into sacred writ for dissertations on the functions of the parts of the human body, as for explanations of the motions of the heavenly bodies. As the kidneys are charged with the secretion of urine, it would be an ignoble idea to search there for the origin of the conceptions and passions.

Certain mutilations, for example, that of the sexual organs, manifestly have an influence on the intellectual and moral character of the man or animal mutilated, should we not be authorized, in consequence, to seek in these parts for the cause of certain qualities? By no means; for the loss of the sexual organs, causes not the loss, but merely the modification of the qualities in question. I shall prove in another place that lesions, or the destruction of the several parts bring on modifications, not only of the whole constitution, but also of the brain; they must, therefore, necessarily modify the manner in which the brain executes its functions.

Are the fluids the material condition for the exercise of the functions of the soul? But can a fluid, where every thing is mingled, in which the constituent parts are momentarily changing, be the seat of determinate and fixed functions? Finally, acephalous persons affected with cretinism, and idiots from birth, have the same fluids and the same solids as those who are well

constituted, without our remarking in them any of the qualities we might be inclined to attribute to the blood, or to the viscera.

Comparative anatomy contradicts all these reveries. The swine, the bull, &c., have the parts in question constituted very nearly in the same manner as man, without having all his qualities. Many of the viscera in question are larger in animals than in man, and yet how inferior are they to us, even in those qualities which they possess in common with us? The wolf, the tiger, the hare, the beaver, have the same viscera; yet their inclinations, their appetites, their mechanical aptitudes are different, and even contradictory. Again; would any one maintain that the heart in the tiger is the organ of cruelty in the sheep the organ of gentleness, in the lion that of courage? Many animals have the liver very large, although we do not remark in them any of the qualities which it has been attempted to palm upon the liver. Others want certain viscera, and yet we remark in them the qualities which are ascribed to those viscera. Insects, for instance, have neither liver nor bile, and yet they are exceedingly irascible. Birds have no diaphragm. Moreover, all the viscera bear the character of the functions with which they are charged, or rather, every thing is there arranged to effect a secretion, or to fulfil a purpose, which has nothing in common with the intellectual or moral functions. None of the parts which we named can, therefore, be the organ of the intellectual faculties, or the moral qualities.

The nervous plexuses, the ganglions, the ganglionic nervous system, cannot be admitted as the seat of an affection, an instinct, a moral quality, or any intellectual faculty whatever.

What I have said above of the viscera, is equally applicable to the nervous plexuses and to the ganglions of the chest and abdomen, which some physiologists would

elevate to the rank of organs of the affections and passions, and which they have made the seat of the soul, or of the affective qualities. The functions of their parts are equally well known ; they concur in the functions of the viscera to which they pertain, and, by means of branches, which communicate with the spinal marrow and with the brain, they establish relations between the animal life and the automatic life. It would be as absurd to attribute to them other functions also, as it would be to attribute to the auditory nerve not only hearing, but also sight. We find ganglions and plexuses in other animals : the oyster, for instance, which certainly is not susceptible of any of the affections, or any of the passions, the seat of which some have attempted to fix upon these parts. In animals capable of affections and passions, the energy of these last is no way in proportion to the volume and number of the ganglia and plexuses. Many animals have ganglions and nervous plexuses larger than man, and yet man has affections and passions much more vivid than these animals. These ganglions and plexuses are found developed in infants and young animals, long before the period when the affections and passions acquire in them a fixed and determinate character. All the mammalia have nearly the same nervous plexuses and the same ganglions. Their intellectual faculties and their moral qualities are, nevertheless, very different. It would be necessary, therefore, to attribute to the same plexuses or the same ganglions a particular function in one animal, and a totally different one in another animal. Each plexus, and each ganglion would be, at the same time, the organ of affections and passions the most diverse. Thus, for example, the solar plexus would be, in a dog, the organ of attachment, love, courage, &c. Would any one attempt to assign to each ganglion, and each plexus, its particular function ? How would he prove such an assertion ?

The advocates of this opinion maintain, at the same time, that the nervous plexuses and ganglia are destined to diminish the impressions which take place in the

viscera, and to obstruct their communication with the brain. But how does it happen, that those very passions and affections, which have been located in these plexuses and ganglions, should manifest themselves with so much violence, and in a manner so irresistible?

These remarks are sufficient to prove, that we cannot seek for the cause of any affection, any passion, any intellectual faculty or moral quality, either in any viscera whatever, or in the nervous plexuses, or in the ganglions.

But it will be objected, that when we become a prey to any violent affection, or an impetuous passion, as disappointment, anger, jealousy, joy, love, &c., we manifestly feel this affection, or this passion, in certain viscera, and in certain parts which have nothing in common with the brain. The common usage of language among all people, it is said, goes in support of this: a man does not hate or love with all his brain, but with all his heart, &c. Therefore, it is in perfect conformity to nature, to regard, as the seat of the affections, the parts which are really affected.

It is nearly a century since Thomasius made this objection, and it was refuted soon after by Burchard.* "Such expressions," says this author, "have not been invented by philosophers, but by the people. Although the sun does not rise or sink as the day appears, or the night falls, it would be an affectation to say that the earth is lifted or is laid down, that the earth has made its revolution; and so it is said, I love you with all my heart, I am glad with all my heart, this tears my heart, &c.; not because these sentiments are produced in the heart, but because, in every violent affection, either the heart or other parts, by the movements of which we describe the affections, in our language, act sympathetically."

* *Christ. Martini Burchardi Meditationes de anima humana, Rostochii, 1726. cap. vii. p. 198.*

In making this objection, the organ which produces an affection or a passion, is in fact confounded with the viscera, on which this affection or this passion acts. The nervous system of the chest, the abdomen, the spinal marrow, of the senses, of the brain, are, as I have just now repeated, put in communication by nervous branches, in order that they may act reciprocally upon each other. Without this reciprocity of action, all the phenomena of the moral and intellectual faculties would be restricted to the brain. The brain could not re-act in any way on the other parts, and could not influence the organs of voluntary motion to produce actions conformable to the affection or passion. The animal and the man would be nothing but brain; the remainder of the body would be merely an inert mass; impressions could never be perceived; the desires, affections, and will, could never cause it to act in their service. If, therefore, as some physiologists think, each of the particular nervous systems were an isolated centre of sensation, independent of the brain, each of these systems would be a special living being, and the unity of one would be impossible.

But this reciprocal influence of which I have just spoken, by no means proves that terror, anguish, disappointment, envy, hatred, love, jealousy, &c., have their seat where their affections are felt. Every body allows that thought exists in the brain, and thought must necessarily precede all the affections. The affections, moreover, act on certain parts, which no one presumes to take with confidence, for the seat of any one of them, and they act with as much more force upon these parts, as such parts are more irritable and more feeble.

Who, in reality, would maintain, with Van Helmont, that the stomach is the seat of the soul, because it is this viscus which suffers most in violent affections? The knees and the lips tremble in anger: will any one therefore say that anger resides in the knees and lips? Intestinal worms sometimes occasion blindness: will any one say that blindness has its seat in the intestines?

Finally, the same affection, the same passion acts upon different parts in different individuals; in one, it acts on the intestines; in another, on the throat; in a person with pulmonic affection, on the chest; in a nervous female, on the uterus, &c. Will any one, therefore, say, that the same affection, the same passion, has for its seat in one individual, the intestines; in another, the throat, &c. If Bichat had weighed this matter well, he certainly would not have regarded organic life as the immediate source of all the passions and all the affections; more especially too, as he had maintained that organic life has attained a high degree of perfection in animals and infants just born.

Instead of placing the soul in the stomach, as Van Helmont did, those of our own day regard it as the grand focus of nearly all diseases. Since this doctrine has obtained, physiologists have been less disposed to place the affections, passions, and instincts in the viscera of the chest and abdomen, in the ganglions and ganglionic nerves.

Let us once more examine their opinions, the reasons on which they are founded, the sources of their errors, and let us claim for the brain its proper domain.

First, let us hear M. Broussais, in his *Examen des Doctrines Médicales*, t. ii. p. 388, &c.—“Cabanis,” says he, a philosopher and idealist, “with Locke, Condillac, Destull, Tracey, &c., attributing all our ideas to impressions made on the organs, all our determinations to pleasure or pain, has observed, that the sources of either do not reside in what are called the senses. He maintains that in the interior of the body, in the viscera, *without including the brain among them*, changes are going on, of which this organ takes cognizance by means of the nerves which it sends to the different tissues. These are what he calls internal impressions, resulting from the play of the different organs. This opinion is a beam of light which nothing can eclipse; a fertile mine of truths, of the first order, and which, in time, cannot fail to be wrought to great advantage.

" Already had Bichat hinted at it, by teaching that the passions resided in the viscera: but he did not live long enough to develop this idea, which was, in fact, that of the ancient philosophers; and we should not now see it contested by physicians, who ascribe every thing to the brain, had this author produced it accompanied by all the reasons which he might have brought in its support.

" Professor Richerand sides with Cabanis, in referring the instinctive determinations to the viscera; and the truth of this fact seems to be no longer contested by any one, except Dr. Gall. This is a step which we owe to the author of *Rapports du Physique and du Moral*. The same professor attributes also to the viscera, the giving birth to the appetites, from whence spring certain passions; but he refers these passions to the intellectual faculties, so that the passions would be composed of determinations issuing from the viscera, and consequently instinctive, and intellectual operations. I had already discussed this question in 1803, in my inaugural dissertation, where I maintained, that the intellectual faculties are never exercised without being combined with passions, and that, *vice versa*, the passions cannot be in exercise, nor be maintained except by the phenomena of the intellect. At some convenient time I shall extract from my *Cours de Physiologie appliquée à la Pathologie*, arguments, which will show that the idea of Dr. Cabanis is in fact one of the keys of etiology and therapeutics."

I am very curious to know how M. Broussais will succeed in illuminating this philosophy!

Let me add to this, that all Cabanis maintains, tom. i. p. 66, that even in a state of health, the state of the abdominal viscera contributes to the formation of thought.

M. Broussais also adopts the axiom, *Nihil est in intellectu quod non prius fuerat in sensu*; and adheres to the school of Locke, Condillac, &c. &c.

" We may further consult," continues M. Broussais, " the thesis of Dr. Balenchana, a young Spanish physi-

cian, educated at the Paris school, which he sustained in August, 1820, on the distinction between instinct and intelligence. We shall find, in this thesis, that the school has adopted some of those proofs, which he extracted from the unpublished course of which I just now spoke."

I have read the thesis of Dr. Balenchana, but I find there nothing but a part of the principles of M. de Blainville.

"I am obliged," says the author, "to consider instinct as it exists in those animals which have the *organs of relation well characterized*; for those whose organization is more simple, are reduced almost to organic life, and finally become confounded with vegetables."

I shall follow exactly, the division of the nervous systems, as established by M. de Blainville, &c.

Afterwards he explains the gradation or perfecting of the instinct, according as animals are endowed with a brain, *properly so called*, more or less perfect.

"As a proof, that the brain controls the movements of the organs of relation, sometimes according to interior impulses, and sometimes independent of these, he cites the movements which we execute without the consciousness of it, either sleeping or waking. Thus in the first state we change our posture when it becomes tedious; we withdraw the hand which the weight of the trunk compresses; we carry the hand to the nose when the nostrils are irritated, &c., because a painful impression being felt in the brain, it decrees the motion."

He goes on to cite a long series of similar phenomena, which should be called automatic motions rather than instincts.

In the second part he treats, in the same spirit, of the perversion of instinct in some diseases; for instance, he speaks of the error of the eye, of the air passages, and of the gastric canals, &c. No where does he allude to innate industry, mechanical aptitude, real instinct, propensity, affection or passion.

In his *Annales de la Medecine Physiologique*, page 5, M. Broussais congratulates himself that M. Lobstein,

in his article on the trisplanchnic nerve, portrays this nerve in a manner that greatly approaches to the idea he had formed of it, *Dict. des Sciences Med.* t. lvi. p. 9, etc. I expected to find there new proofs in relation to the seat of the affections and passions. But, so far from it, this idea has never presented itself to the mind of M. Lobstein. Once only, he says, p. 37—"In the passions and movements of the soul, where these sensations are so strongly perceived, they are not, as Bichat thinks, the epigastric organs which receive the impressions: anger, terror, &c., do not act in the first instance on the stomach, the liver and the spleen before affecting the solar plexus; but it is this, which is affected before the viscera, I have just named."

But we find nothing here, which tells us that the plexuses and the ganglions are the origin and seat of the affections and passions. As, according to my own ideas, the nerves derive their origin from the ganglions and the plexuses, it is natural, that the influence of the brain should arrive sooner at the plexuses and ganglions than it can be propagated to the viscera by the nerves. M. Lobstein proves, by excellent anatomical researches, that the trisplanchnic nerve belongs to automatic life, and as we have proved in our section on the intercostal or great sympathetic nerve, that, by means of the filaments of communication with the nervous system of the vertebral column and the brain, it establishes a reciprocal action and reaction of the vegetative or nutritive life with the life of relation, or animal life; that, consequently, the brain may be informed, particularly in cases of disease of the nerves, or exaltation of the viscera of the chest and abdomen, of what is passing in the internal system, &c. M. Lobstein gives to the trisplanchnic nerve its proper function, independent of the functions of the brain, and to the brain its proper functions equally independent of the trisplanchnic nerve; always admitting, as he should do, the reciprocal influence of one on the other.

In addition, M. Lobstein also considers the trisplan-

chnic nerve contrary to data from comparative anatomy, and contrary to the opinion of Winslow, Sœmmering, Bichat, and myself; as taking its course from above downwards, &c.; and he admits the erroneous idea of Johnson, Lecat, Metzger, and Reil, on the use of the ganglions.

Thus it is the same as proved, that M. Lobstein places the affections and the passions in the ganglions and in the plexuses of the trisplanchnic nerve.

The eloquent M. Virey avoided, for a moment, the error of confounding the involuntary motions with the affections and passions. He distinguishes the affections and passions from the propensities, from the bias which impels us to this or that occupation, to poetry, to the sciences, to the mechanical arts, or to war, &c. The affections and the passions, according to him, are joy, sorrow, disappointment, languor, fear, anger, attachment, modesty, distrust, audacity, despair, envy, jealousy, hatred, vexation, indignation, aversion, emulation, diffidence, fanaticism, hope, contempt, admiration, &c. &c. Among the number he also reckons voluptuousness, love, friendship, ambition, pride, which are, however, permanent propensities. *Dict. des Sciences Med. tom. xxxix. Passions.*

If I had been as erudite as M. Virey, I should have been able to dispense with searching for the seat of the organs. The ancients would have apprised me that *splene rident, felle irascunt, pectore amant, pulmone jactantur, corde sapiunt.*

Where M. Virey proposes to speak of the seat of the principal centre of the passions, he says, "The nervous centre situated near the cardia or superior orifice of the stomach, which traverses the diaphragm, has been considered as one of the principal springs of the animal machine, and the seat of all the affections which are referred to the heart.

" We feel, in fact, about this precordial region, the recoil of the passions. Birds, reptiles, and fishes are always destitute of a diaphragm, and the nervous plexuses of the

ganglionic system are somewhat differently disposed from those in the mammalia ; wherefore they should feel in a somewhat different manner *the influence of the affections.*" A singular opinion. And is he speaking of the seat of the influence ? Of the latter, every one will allow.

" It is very manifest," he continues, " that the region called the phrenic centre, exerts a great influence over the mind. This part being irritated by poisons, or benumbed by narcotics, immediately disturbs the brain, and agitates the other parts of the body. When it is stimulated or exhilarated by spirituous liquors, for example, we observe that the mind becomes more brilliant, and enthusiastic, or its character, more gay. All these effects seem to depend on the great mesh or plexus of the nervous branches, on the aorta and crura of the dia-phragm, a remarkable nervous centre, called the solar plexus, from which depart, also, inferior fasciculi by secondary plexuses. Its nervous branches, which extend throughout the whole intestinal system, send out, as it appears, their filaments to almost all the organs of the body, and cause them to sympathize together, or connect them with this centre."

Here, also, he merely speaks of the influence of the phrenic region over the brain and other parts of the body. Nevertheless, M. Virey, as if he had *proved* that this region is the seat of the affections and passions, which with him are synonymous, continues :—

" M. Gall, on the contrary, pretends, as did Descartes formerly, that the passions reside in the brain and not in the ganglionic system, which is found well developed in animals without encephalon, *properly so called*, in which it would be difficult, adds this author, to suppose the existence of passions. Yet, who does not know that the minutest zoophytes, worms, and insects, experience fear, desire, love, &c. There are then, passions without the intervention of a brain, and in being least capable of ideas and reflections ; for the passions belong, in fact, not to the will, but to instinct, in all the brute creation."

M. Virey does as much honor to the zoophytes, as Darwin did to plants. Let him be reminded of what I have just stated in regard to M. de Blainville and M. Balenchan, who supposed themselves obliged to admit of the operation of instinct merely, in all animals *whose organs of relation were not well characterized*; for those whose organization is the most simple, are almost reduced to the enjoyment of organic life, and at last become confounded with vegetables.

"The passions, properly speaking, belong therefore to animals as well as to man, because they reside more especially in the ganglionic nervous systems, or produce emotions of the heart. To become convinced of this, let us ascend a little, and show that the interior nervous system *influences eminently* the nervous tree of the life of relation or the cerebro-spinal system."

Influences eminently! but yet once more, is it the same thing to influence, as to be the seat of any thing?

And why dispute whether animals have affections and passions? what proves this better than the new physiology of the brain? On the contrary, according to the principles of M. Virey and his partisans, animals, cattle, horses, goats, &c. should have affections and passions much stronger than man; for their ganglionic system is much more powerful than that of the human species. Observe, also, that in the pacific frugivora and herbivora, the reindeer, the giraffe, &c., it is much more considerable than in the tiger and the hyena.

And as M. Virey never goes farther than to prove the influence of the ganglionic system on the brain, though he seems to desire to prove to his readers the seat of the passions, I readily accord to him the influence of gambling, milk-diet, Sherry wine, &c., on the functions of the brain.

To give additional force to such arguments, M. Virey supports himself on the authority of what Quintilian says: "Pectus est quod nos disertos facit et vis mentis; ideo imperitis quoque si modo sunt aliquo affectu concitati, verba non desunt."

"If the passions existed in the brain, how would terror take away all presence of mind, all energy from the brain so as to induce syncope ! It is, therefore, requisite that passion should exercise itself in some other part than the organ of thought," p. 429. He admits, however, p. 479, "that admiration and contempt depend more immediately on the brain, as well as curiosity, enthusiasm, infatuation, respect and veneration: vanity and pride are, according to him, mixed affections."

Let us, in the first place, with M. Virey, allow to the brain what belongs to it, whether a third part, a half, or two thirds, and let the different ganglions dispute for the rest.

Again: M. Virey says, "According to Prochaska, the passions act on the heart by means of the nerves of the eighth pair; but may it not be maintained, on the contrary, that the emotions of the heart ascend to the brain by these same nervous branches ? For Vauvenargues said with reason, *great thoughts come from the heart.*" An excellent proof this of Vauvenargues, since every body knows that the thoughts of an animal are sublime, in proportion to the magnitude of his heart ! Here we have, at one stroke, not only the affections, the passions, but also the thoughts, the sentiments, the propensities, virtue and vice, transported to the heart !!! Such an accumulation of offices should not be permitted.

The same inexhaustible and poetical M. Virey brings up again, in his *Historie naturelle des Mœurs et de l'Instinct des Animaux*, the same arguments, and with the same force.

At page 15, vol. i. By preserving throughout, the denomination *medullary matter* for the fibrous substance of the brain, he causes the nerves to emanate from the brain and spinal marrow, not bearing in mind that he is soon going on to speak to us of a large number of animals, who have nerves and a ganglionic system without having either spinal marrow or brain. This proves that a man may be extremely wise, without having a good memory. "Instinct," says he, "is innate in the

heart; it emanates from within the internal organs of life; it acts without the concurrence of the brain." Vol. i. p. 70, 71.

"From what we know of the marvellous instinct of insects, of many of the mollusca, and other headless animals, we can readily comprehend how deceptive the explanations proposed by Dr. Gall are to demonstrate the propensities of animals by the protuberances of the brain. Since there does not exist in acephalous animals nor in a host of other beings with very lively instincts, any brain, properly so called, nor, consequently, any *bumps* or protuberances, it follows that they should have no innate propensity, no determination whatever."

According to the same method of reasoning, the brain could no longer be considered, in the perfect animals, and man, the centre of life; since these imperfect animals enjoy life without a brain, and man, he every where expressly says, lives entirely by the brain.

M. Virey, as well as M. Balenchania, saw himself obliged, doubtless, conformably to comparative anatomy and physiology, to admit of instinct in those animals only who have the organs of relation.

But M. Virey knew perfectly well, of what volume this organ of relation, this brain should be, to be able to produce what he calls instinct. For this reason he was satisfied with affirming, that "in the mollusca, the shells, in the crustacea, or the crabs and lobsters, in insects and worms, the nerves are as much more scattered, as much more divided into different centres throughout the body, into different *little brains*, (a very happy term, which has been for a long time employed to designate them as the seat of the passions,) or ganglions, as there is *scarcely any, or almost no* brain in the head. Hence result very singular effects; for example, if you cut off the head of a snail or an earth-worm, these animals, far from perishing, reproduce a new head. But if you decapitate a quadruped, a bird, a reptile, a fish, who have brains, the animal necessarily perishes. Tom. i. p. 127."

In insects and worms the nerves are as much more

scattered, as much more divided into different centres.
May not the nerves and the scattered and divided ganglia, therefore, exist in other animals, and in man?

Water-lizards and snails have, therefore, no brain; since they not only do not perish when decapitated, but even reproduce the head. It is a deplorable embarrassment to be obliged to have recourse to such terms as *scarcely any and almost no* brain. Let M. Virey tell us what is the volume of the ganglionic nerves, in the smallest species of ants, and how those little points produce instincts, and an economy so admirable.

And if M. Virey admits that, in the more perfect animals, life is concentrated in the brain; whilst, in animals of an inferior order, it is distributed among several points, why should he refuse to admit, as I have declared in my large work, that the same thing may take place with respect to the affections and passions.

M. Virey betrays himself more and more. He continues, t. i. p. 467,—“The invertebrated animals have no brain, *properly* so called, since the ganglion which takes its place is an appendix to the nervous system, analogous to the great sympathetic, and which may be cut off, in worms and the mollusca, without the animal perishing.”

I ask, then, whether the brain which we find in the head of wasps and tortoises, is not a brain—because we may cut off the heads of these animals, without their perishing, at least for a considerable length of time?

“Those,” he insists, p. 471, “which are provided with a head, have not, on that account, a true brain, although we generally find in it a nervous dilatation, a ganglion, or a single or double knot. This imperfect brain is by no means in them the motive principle of the whole body. We decapitate earth-worms and snails, and, so far from perishing, they shoot out a new head. On the other hand, every vertebrated animal perishes when the head is amputated; because the brain in it, becomes as it were a centre about which every thing conspires.”

M. Virey supposes an *intelligent* vital force, which causes the parts which have been amputated, such as the

head in the Naiada, the claws of lobsters, to be reproduced. That which causes the branches of a tree to shoot out, is also, doubtless, an intelligent vital force !

Should we not be tempted to suspect that all these gentlemen, who understand so thoroughly all the little brains of worms and insects, have employed, both for eyes and mind, microscopes of an admirable perfection, since the gross structure of the human brain, and of other large animals, remains unknown to them even to the present time.

I should not have laid so much stress on this subject, if the opinion of Cabanis, Broussais, Virey, &c., were not still the opinion of almost the whole medical world. Mr. Tupper has presented the same objection in his *Inquiry into Dr. Gall's system concerning innate dispositions*, page 52. And M. Delpit also says in the *Dictionnaire des Sciences Medicales*, t. xxxviii. page 263 : — “ We are very far from granting that the different organs of the affections and passions are concentrated in the brain, and exclusively attached to its partial divisions. The opinion of the philosophers of antiquity, as well as those of our own time, supported by the testimony of our own consciousness, have placed in the precordial organs, or in those of internal life which are farthest distant, and which appear the most independent of the brain, the seat of our most lively emotions and our most impetuous passions.” M. Delpit does not allow, unconditionally, that even the intellectual faculties are concentrated in the brain.

He also cites Bichat for authority, that the organs of internal life, that is to say, the abdominal viscera, the ganglionic system, are the sole seat of the affections and passions, and that the brain is never affected by it. “ Every passion,” continues he, “ has its determinate seat in some organ of the internal life: this is the goal to which they tend, the centre from which they depart. This result is proved, not only because the passions essentially sway the organic functions by affecting their viscera in a special manner ; but still more, because the state

of these viscera, their lesions, the variations in their sensitive forms, concur, in a very marked manner, to produce a certain species of passion, such as joy, sorrow, love, aversion, courage, timidity, anger, indifference, &c."

Do my readers now know what instinct is? Have they been able, amid all these incoherent vagaries, to decide what all these gentlemen mean by instinct, the affections, the passions, the seat, influence, &c. &c.? Will they not be surprised to read in *Histoire des mœurs et de l'Instinct des animaux*, by M. Virey, t. i. p. 483 : "Instinct is nothing else than the external manifestation of that same wisdom, which in the interior directs all the vital functions of the body;" that it is instinct which contracts the pupil against the light, and which dilates it in darkness; which causes the stomach to revolt at putrid substances, which presides over the secretions and excretions; which retracts the muscles instantaneously, when they are pricked or burst. Finally, instinct does not result from the organization, but it precedes and elaborates it. "The interior or ganglionic nervous system, destined perpetually to concur with the nutritive and reproductive functions, is the exclusive seat of the instinct; from it emanate the spontaneous impulses, the affections of the heart, the passions which carry away man and animals to the performance of inconsiderate acts, and it is this system which watches, unceasingly watches, over the preservation of the individual, even in sleep, in delirium, (*especially when the delirious person casts himself from a window,*) in diseases; it presides over the perpetuation of the species, love, the fecundation of germs, over the egg and the foetus." T. i. p. 493.

This is enough,—it is too much! Let us proceed.

Instinct, it may be inferred from all these passages, is sometimes an occult force, a single personage; sometimes it presents itself in the plural form. Its, or their functions are very various, and very irreconcileable. To-day, instinct keeps incessant watch over our preservation; to-morrow, it impels us to rash deeds; to-day, it gives us

up to gluttony ; to-morrow, it commands us to suffer ourselves to die with hunger. It provokes automatic, involuntary motions ; it is the organizing force, the moving power of vegetative life, the organ of the affections and the passions. Sometimes its seat is nowhere, since it precedes organization and presides over it ; sometimes it exercises itself in the zoophyte without any nervous apparatus ; and sometimes it is seated in the multiplied and scattered ganglions of worms, mollusca and insects ; soon after it is concentrated in the phrenic centre, in the diaphragm, in the stomach, in the heart, or in some other viscus, without enjoying an exemption from the service of controlling at the same time all the viscera at once, and from contributing also to the formation of thought. The viscera are sometimes the source of intelligence, the immediate seat of the affections and the passions, and sometimes they exercise only a mediate influence on the brain. The mollusca, worms, and insects, have, sometimes, little brains all over their bodies ; and sometimes the ganglions or nervous masses, placed above the oesophagus, are not brain. Animals sometimes have almost none, sometimes scarcely any, sometimes no brain, properly so called, sometimes next to no brain at all, in their little heads, and sometimes a very unimportant brain. P. 470, 471.

M. Virey ascribes, (proportion being observed,) more strength to a cockchafer, an ant, a flea, &c., than to an elephant : why does he not make the same calculation for their little brains ?

Certainly ; the physiognomy of truth does not present such contortions, such vacillation !

I ascribe all these errors to two sources ; complete ignorance of the functions of the brain, and confused notions of the various phenomena of organization.

There is an inward consciousness, that the affections and the passions are exercised within us. Their action is much more marked in the viscera of the chest and abdomen, than in the head. We must needs seek for their seat. The brain and its functions being unknown,

they were consequently referred to the spot which was supposed to be most affected ; that is, the heart, the stomach, the diaphragm ; such was the most ancient and the most general opinion.

Scarcely had some superficial knowledge of the brain been acquired, before several philosophers and physiologists regarded it as the seat, not only of the intellectual faculties, but also of all the affections and all the passions.

Then came speculative philosophers and metaphysicians. They attributed to the soul all the phenomena of moral and intellectual life. They recognized no organ for any one of its functions. Impressions on the external senses gave birth to the instincts, the propensities, and the faculties ; and, if the affections and passions were placed in the viscera, it was rather in consideration of their action, than of their origin and their seat.

At a later period, and much too late, especially in France, it was judged that there was some internal source for what is called instinct, affection, passion. As the brain at this time was held in no consideration, it was natural to make a present of them to the heart, &c.; and when the anatomy of the nervous system was brought to some perfection, this was immediately proclaimed as their seat and origin. Hence the ancient reputation of the heart ; hence the zealous admirers of the wonders of the solar plexus ; the phrenic centre, the ganglionic nervous system.

But now that we have become able to assign, with certainty, to each organ, to each nervous system, its proper function ; now that we know the graduated scale of beings and of nervous systems, our ideas are altogether freed from these absurdities.

We know that the ganglionic nervous system, or the trisplanchnic nerve, is intimately connected with the vascular systems ; they always coexist, and, oftentimes, where there is no brain or spinal marrow.

All the branches of these ganglionic nerves accompany the arterial trunks, branches and ramifications, and enter with these branches into the different organs; which evidently proves, that the trisplanchnic nerve has no other office than to preside over the functions of the life of nutrition, to establish a reciprocal influence between this and animal life, by means of the branches communicating with the nervous system of the vertebral column.

We know the functions of the stomach, the diaphragm, the liver, the heart. We know that the mammiferous animals have these parts in common with man; that in the larger species they are even more voluminous than in man, although their affections and passions are neither so numerous nor so energetic. We catch a glimpse of the absurdity of entrusting the same part, the heart, for instance, with functions directly opposed to each other. We find it still more extraordinary to constitute the heart the seat of cruelty in the tiger, of gentleness in the lamb; of fidelity in the dog, of perfidy in the cat; of courage in the bison, and of timidity in the hare. We know, also, that emotion being felt in certain parts, in connection with the affections and passions, proves nothing as to their seat. We no longer confound the origin of our affection, with the reaction of this affection on some part, since experience has taught us, that by pursuing a method so bad, this or that passion or affection would have a different seat in each individual. Jealousy chokes me, commiseration painfully contracts my jaws and palate, amorous emotions excite violent sneezing; the sentiment of benevolence brings tears into my eyes; anger gives me colic, and indignation causes my knees or lips to tremble. Let each one watch himself, and he will himself discover a different seat for jealousy, pity, amorous emotions, the sentiment of benevolence, anger, indignation, &c.

The slightest attention demonstrates to us, also, the falsity of the opinion, according to which the brain is never affected in the affections and passions. To be

brief, let any one read on this subject all the works of the physiologists and psychologists ; let him read the works of Pinel, Esquirol, Georget,* the last of whom, even if selfishness did not interest me in him, could never have too many readers,—and they will soon be convinced, that in all the affections, the brain is more or less disturbed. M. Georget, in the opinion of M. Spurzheim and myself, is the only author who has well distinguished the instincts, the affections and the passions ; and who has proved, in the most decisive manner, the part which the brain takes in each affection. He establishes, with reason, that suffering and trouble, moral affections, are synonymous with suffering and trouble, cerebral affections. Among other proofs that the origin of the affections is in the brain, he says, page 339 : “ Observe, moreover, what are the most frequent accidents of these violent commotions of the organization ; they are most frequently diseases of the brain, insanity, epilepsy, madness, convulsions, hysterick and hypochondriac vapors, syncope, apoplexy, catalepsy, the cerebral inflammations, ataxic fevers, &c., and sometimes sudden death. A remark, extremely important to be made, is, that, if the moral affections are followed by diseases of the brain, diseases of the brain are frequently characterized by certain moral affections ; an evident proof that both are derived from the same source.

“ The affections only ensue on the perception of an object ; no one is frightened except at the unexpected approach of imminent danger ; anger is usually the offspring of wounded self-love ; we are not grieved unless disagreeable sensations, unexpected and unfavorable news have been received by the brain. The brain is, therefore, always affected first ; it is also from the brain that issue those sudden and more or less violent movements, which radiate towards the principal organs of the economy, and sometimes towards them all.

* Physiologie du Système Nerveux, t. i. p. 315.

"If the affections and passions did not appertain to the action of the brain, and depended on the other viscera, they would be, as to number, extent, force, &c., in direct proportion to the volume and integrity of these last, and in nowise to that of the first. Yet, see the pacific herbivora, with four stomachs, with a voluminous liver, with enormous lungs and heart; their whole life consists in browsing upon herbs. They have, moreover, the great sympathetic nerve very much developed; which proves, that this nerve presides especially over the nutritive functions. Observe, also, the idiotic, imbecile, insane, the deficient in mind, all such as prefer to live more tranquilly under the dominion of the stomach than under that of the brain; all these individuals are generally gross and fat, and have enormous viscera, and the stomach in the best possible order; and yet the idiotic, imbecile and demented, have neither passions nor affections; the others are scarcely moved by operations, which shake the whole machine of beings with sensible brains. Cabanis, therefore, fell into a serious error, when, after having said,—'In other children the state of the brain entirely obstructs thought; yet they live more or less healthful and vigorous,' he adds, 'and the instinctive functions which appertain to human nature in general, manifest themselves in them nearly according to the ordinary periods and laws.'*

"How can we conceive of general effects so varied, otherwise than as those which accompany or follow the manifestation of these affections, these sudden and severe moral shocks, without ascribing to them a common source? You will, therefore, place shame in the cheeks, disappointment in the epigastric organs, joy in the organs of the thorax, because it is these parts which are ordinarily most especially affected in such cases. But in this way you will, most of the time, make these phenomena depend on the whole economy; for, frequently,

* Georget, t. i. p. 163.

the whole economy is reached by them. Thus in excessive fright, we observe, on the part of the brain, extreme moral disturbance ; on the part of the heart, palpitations ; the dejections take place involuntarily ; the skin is covered with cold sweat, or becomes goose-flesh ; the legs can no longer support the body ; sudden jaundice supervenes, &c., or again, they will sometimes have different seats in different individuals ; for in one, the stomach is most actively affected ; in another, it is the liver ; in a third, the brain ; in a fourth, the lungs or the heart, &c. Can such opinions be admitted ? If, on the contrary, you recognise the true cause of all these disturbances ; if you resort to the brain, everything is explained : this organ is in relation with the whole organization ; it is susceptible of feeling impressions, variable in their nature and degree of intensity ; its sympathetic reactions may be as various as its particular affections, and as the organs over which it exercises its influence.

" It is objected, that in those great movements of the economy, the brain participates in no degree with the general trouble of the other viscera. This is false ; this cannot be true. Without reckoning, that it is by the brain, that the sensation, which has immediately preceded the passion or affection, is perceived, do we not see that the moral effect which we call anger, disappointment, fear, &c., is only a cerebral effect ; that it is always accompanied by great derangement in the ideas ; that it is very frequently followed by cerebral diseases, insanity, hysteria, hypochondriasis, and the whole host of symptoms denominated nervous ; paralysis, apoplexy, febrile cerebral diseases, &c.? The brain, like all other organs, reveals its sufferings by changes in the exercise of its functions, in the manifestation of the phenomena of which it is the source. In these cases, for example, the moral state and the disorder of the ideas, are the expression of the cerebral suffering.

" Besides, does it not often happen, that the signs of the lesion of an organ are exhibited most manifestly in

other organs with which it has sympathetic relations ? Will you say that in the phlegmasiae, which are going on to a fatal termination, the organ, which is their seat, is not diseased, because the brain, sympathetically injured, can no longer perceive the painful sensations which it perceived before ?

" So soon as physiologists shall consider the affections and passions as simple cerebral acts, as organic operations, it will be absolutely necessary that they should modify or even change the language, much too metaphorical and figurative, which they so frequently employ to delineate effects. From the manner in which they experiment, one would suppose, in truth, that they were treating with individual beings, with devouring monsters, who issue from some unknown lurking place, and spread their ravages on all sides. Such language should be reserved for poets and for certain moralists, and banished from the recitals of the observers of nature.

Let us determine, definitely, what is a passion and what is an affection, and all disputes will cease of themselves.

Every faculty, whether intellectual or affective, so soon as it has attained a very energetic and resolute degree of action, must be called *passion*. In this sense the philosopher may have the passion of thought, of seeking for the relations between cause and effect; the poet may have the passion for poetry, the musician for music ; the painter, the mechanician, the mathematician, those for painting, mechanics and mathematics. As all these faculties have their organization in the brain, it follows that their exalted action has equally its seat there.

The affective qualities, the instincts, the sentiments, the propensities, when they become habitually imperious, are also passions. It is thus that love increases into a passion : excess of the sentiments of benevolence or of devotion is a passion : the love of offspring, propensities for combats, ambition, &c., may become passions. Now, I have proved, particularly in my special treatises

on each of these affective qualities, that, like the intellectual faculties, they have their organs in the brain. Consequently, their respective passions should also have their seat there.

But where are the organs of the affections seated? They have none, neither in the plexuses, nor in the viscera, nor in the brain. I will explain myself. Have pleasure and pain particular organs, peculiar to themselves in the brain? No; pleasure and pain are modifications, modes of the general sensibility of all the nerves. We have painful and agreeable sensations in the head, in the stomach, in the intestines, in the senses, &c. It is the same with the affections. They are modes, modifications, of the organs of the intellectual faculties and of the affective qualities; they are emotions, shocks, commotions, assaults; they are, literally, affections of the brain; they have, therefore, the same seat and the same origin as the intellectual faculties and the moral qualities. They all and always commence in the brain, which exercises its universal influence over all other parts of the body. And if a remote cause, a disease of the liver, of the heart, or of the stomach, disposes a man to some affection, it is because this same cause has first exercised its influence on the brain, and has altered its functions.

Neither of the five senses is the seat or the organ of any one moral or intellectual force whatever.

After what I have said, in my first volume of this work, on the functions of the five senses, and of the spinal marrow, it is superfluous that I should a second time engage in the detailed examination of this question. I have described the limits to the sphere of activity to each sense; I may, therefore, content myself here, with presenting some ideas intimately connected with this discussion.

If we except the instinct common to animals and man, which leads them to subsist, by preference, on vegetable or on animal substances, or to make use of a mixed nourishment, there is scarcely any intellectual faculty or moral quality, which we should be disposed to attach to the sense of taste. Those who still adhere to ancient prejudices, carry back science to the period when the internal forces both of animal and of man were absolutely unknown. They did not reflect, that the external instruments and the senses ought to be in unison with the more noble internal organs, and that, without the inspiration of these last, the first are absolutely impotent.

Others had perceived, before me, that the sense of smell by no means explains many of the phenomena which it is the custom to deduce from it. They have been obliged to have recourse to a sixth sense, to explain as well as they could, how the swallow, the nightingale, the quail, the stork, find their way in the spring to the habitation they had left in autumn; how dogs and pigeons which have been removed in a close carriage, or in a sack, to countries where they have never been, will, nevertheless, find their original lodging again.

If the ear is the primitive source of music or song, why do not all the animals, who have a more delicate ear than we, sing? Why do not all birds sing? Why, in the singing birds even, is the female almost always destitute of song? Why does each bird remain constant to the warbling of its species, even when it has never heard its parent sing, and though it may have been nurtured by birds of a different species from their own? Why is not a talent for music proportioned to the delicacy of the ear? How shall we explain the origin of music, if it has none other than imitation? Whence issues the creative genius of a Gluck, a Mozart a Haydn, a Grétry, &c.? Is it to the eye that the invention of painting is due? Ask the painter if he measures the perfection he has acquired in his art, by the perfection of his eye; you will find that he will

speak to you of something more noble than vision, and this even when the question shall not regard either invention, or design, or execution, but merely the perception of the true tone and harmony of colors.

The example of fools and of the imbecile refutes those who attribute, also, to the sense of touch, attention, memory, judgment, imagination, our desires, our intellectual faculties, and even our arts : "the intelligence, the solidity and the perfection of our ideas, the extreme delicacy of the sentiments and of the ideas, the delicacy of the perceptions, the sprightliness and address of woman, to her skin of thin and tender tissue." *

How, then, shall we explain, by the five senses, which are the same in the majority of animals, the great diversity of their instincts and of their mechanical aptitudes, &c.? How shall we explain why such a species of animal constructs nests, or burrows, and why another species lives in flocks, and another, solitary? Why is it that sometimes it is the female alone who rears the young, and sometimes the male and female concur in their education? Why is man, with less perfect senses, infinitely superior to animals by his moral qualities and his intellectual faculties? why do these qualities and these faculties vary much according to age, sex, &c., while the senses remain nearly the same?

There is, then, no relation between the moral qualities and the intellectual faculties, and the number of the external senses, nor the period of their development and perfection. The external senses are circumscribed to their proper and special functions; they transmit to the brain the impressions of the external world: the manner in which these impressions are put in operation, and the different ends for which they are ultimately elaborated, depend on the different nature of the internal powers.

* *Virey, Histoire des Mœurs des Animaux*, t. i. p. 130.

The moral and intellectual powers are founded neither upon the entire organization nor upon the temperaments.

Many modern physiologists declare, that it is absurd to deduce any quality or function from any single part whatever. There is no part, say they, capable of acting by itself; no function, and, consequently, no manifestation of the moral and intellectual faculties becomes possible, but by means of the whole animal organization. This entire organization forms but a single organ, and all the differences which we observe in the functions of man and other animals, arise wholly from differences of constitution and temperament.

Each organ is, without doubt, subject to the general laws of organization. The parts cannot fulfil their destination before they are developed and brought to a certain degree of perfection: hence it follows, that each organ, although independent of all the others, in regard to its particular functions, must have communication with the whole body in general, and with the blood-vessels, lymphatics, nerves, &c. But, if we should conclude from this, that the whole body is the instrument of each particular function, we might as well say, an eye when plucked out, does not see, an ear when destroyed, does not hear, and therefore it is the body, taken collectively, which sees and hears. But why does the body, taken collectively, cease to see, hear, and secrete bile or saliva, when there is a particular derangement in the eye, the ear, the salivary glands, or the liver? If every thing depends upon the organization taken collectively, why do physiologists study the functions of the separate parts, and why has nature constructed such a variety of apparatus, when she might have accomplished her ends by one single expedient? But, if she has constructed a particular apparatus for each function, why should she have made an exception in the brain? Why

should she not have destined this part, so curiously contrived, for particular functions?

In regard to temperaments, I cannot stop here to examine, whether the idea formed of them is correct, and whether the manner in which they are divided is exact. Let them remain in the sense received by physiologists. I ask, is it correct to deduce from them certain primitive, determinate, moral or intellectual powers?

The idea, which the ancients had upon this subject, was founded sometimes upon chemical, sometimes upon mechanical principles, and varied according to the opinion which they adopted relative to the principle of life. But they pretty generally admitted, that the intellectual and moral character of man depends upon his temperament. When they recognized the influence of the body upon the functions of the soul, they attributed it much more to the proportions of the solids and fluids, than to any single part; as, for example, the brain. I pass over in silence innumerable errors of the ancients, and content myself with pointing out a few, which ought not to have been brought forward again, after the physiology of the nervous system had been studied with care and attention.

Richerand, speaking of the sanguineous, says with Pinel,—“The conception will be quick, the memory excellent, the imagination lively and cheerful; they will delight in the pleasures of the table and of love. Constancy and levity are the principal attribute of men of this temperament; extreme variety seems to be for them as much a necessity as an enjoyment; they are good, generous and sensible, lively, passionate, delicate in love, but fickle. Such was Richelieu. In vain will he whom nature has endued with a sanguine temperament, endeavor to renounce the pleasures of sense, acquire a fixed and durable taste, or attain, by profound meditations, to the most abstract truths; overruled by his physical propensities, he will be incessantly brought

back to the pleasures from which he would flee, to the inconstancy which is his lot.”*

Speaking of the athletic temperament, he says “the head is very small. In the history of his twelve labors, we see him (Hercules) without calculation, or reflection, and as if by instinct, courageous because he is strong, and seeking obstacles in order to surmount them, sure of crushing every thing that resists him.”

Of the bilious temperament:—

“The passions will be violent, the emotions often hasty and impetuous, the character firm and inflexible. Daring in the conception of a project, constant and indefatigable in its execution. Full of audacity, courage and activity. Such were Alexander, Julius Cæsar, Brutus, Mahomet, Charles XII., Peter I., Cromwell, Sixtus V., Cardinal Richelieu. They are capable of the deepest dissimulation, as well as the most obstinate perseverance. This temperament is also characterized by a precocious development of the moral faculties.”

Of the melancholic:—

“The imagination is gloomy, the character suspicious and timid; Tasso, Pascal, J. J. Rousseau, Gilbert, Zimmermann.”

Of the phlegmatic:—

“They have, generally, an insurmountable inclination to sluggishness, and an aversion from the exertion either of body or mind. They are ill suited to business. The imagination is frigid, the passions excessively moderate. They have virtues arising from temperament, on which they have no reason to pride themselves.”†

* In a note, p. 519, Richerand himself refutes what he has advanced in the text. He says,—“The histories of Henry IV., Louis XIV., Regnard, and Mirabeau, prove, that sanguine men, *when circumstances require it*, join to an extreme love of pleasure a great elevation in their sentiments and character, and can show proofs of the most distinguished talents of every species.”

† Nouveaux éléments de physiologie, 7 édition, t. ii. 514, et suivantes, ccxxix. ccxxxiv.

Cabanis,* also, sought for the moral and intellectual character in the temperament, by following the steps of the ancients, whose spirit of observation he extravagantly admired. "The bilious, melancholic temperament," says he, "is the most unfortunate and fatal of all. This appears to belong to fanatical, vindictive, and sanguinary nations; it determines the sombre transports of a Tiberius or a Sylla; the hypocritical frenzy of a Dominic, a Louis XI., or a Robespierre; the capricious atrocities of a Henry VIII.; the deliberate and persevering vengeance of a Philip II.: it combines audacity and violence with inordinate ambition and resentment; the gloomy terror which leads from crime to crime, is augmented by its own peculiar effects."

Hallé likewise deduces from the temperaments, not only the mode and manifestation of the faculties, but also the moral and intellectual character, and determinate faculties, such as great promptitude in judgment, absolute will, &c.†

Fodéré asserts, that the conduct of the most celebrated men is conformable to their temperament, and cites in support of his assertion Plutarch's Lives of Illustrious Men.

According to Kurt Springel, persons of excessive irritability are liable to form false decisions; they have an ardent imagination, and treacherous memory; they are irresolute, inconstant, of a penetrating mind, and subject to profound sadness, and extravagant gaiety. He imputes the sensuality of women to the delicacy of their organization. "Persons of a lax temperament," continues he, "have a weak but tenacious memory, and a slow conception; they are indecisive and cold, both in love and hatred. Those of a rigid temperament are subject to many errors; they have a tenacious memory, and can contemplate, steadily, a single object; their passions, like their imaginations, are fiery. †

* T. ii. p. 548.

† *Dictionnaire des Sciences Médicales*, t. liv. art. Tempéramens.

‡ Cabanis explains all the shades of character, moral and intellectual, by the diversity of temperaments. *Rapports du physique et du moral de l'homme*, 2d edition, t. i. p. 404, et sequentes.

It must be admitted, according to these physiologists, that the intellectual faculties and moral qualities are determined almost entirely by physical and mechanical considerations. Laxness of fibre, indicates a weak memory; rigid fibre, obstinacy; a humid constitution, sluggishness in the intellectual functions; light blood, a ready conception; a robust constitution, courageous resistance. Can any accord better?

If the delicate constitution of women accounts for their lasciviousness,—to what is that of men, of the ape, the dog, the bull, to be imputed?

The examples in history of famous men, endowed with this or that particular temperament, prove nothing. These citations bear the character neither of a philosophical mind, nor a uniform law of nature. The temperament of an illustrious man has never been decided beforehand by a physician skilled in philosophy; and I omit, in silence, the prejudices which would have influenced such a decision. Plutarch has never determined the temperament of his heroes, either from his own observations, or the testimony of their contemporaries; yet physiologists of the present day pretend to know what was the temperament of Aristides, Timoleon, Cimon, Dion, &c. Each one endeavors to learn the actions of great men, and then, according to his own hypothesis in regard to the cause of their qualities, he ascribes to them some particular temperament. Innumerable observations induce me to adopt the opinion of Helvetius, who maintains that, with any temperature whatever, a man may, or may not, possess genius. Genius and stupidity are found in the sanguine, bilious, phlegmatic, the fat, lean, weak, and robust. I know both men and women, who, with a hereditary disposition to dropsy, feet constantly swollen, abdomen turgid, the skin cold and spongy, the face pale, and evacuations frequent and slimy, are of an irascible character, quarrelsome, violent, imperious, ardent in love, furious in jealousy and anger, rash in their enterprises, prompt, active and indefatigable in the execution of their projects. I know, on the

contrary, sanguine and vigorous men, who find pleasure in sleep and idleness only; whom neither the allurements of gold, the voice of honor, nor the charms of women, can arouse from their lethargy.

Whenever I read expositions of the temperaments, I imagine myself surrounded by fortune-tellers, such as Porta, Pencel, Pernetti, Huart et de la Chambre, who, if they know whether a person has black, fair, red, stiff, straight or curly hair, hazel or blue eyes, straight or arched eyebrows, the base of the nose wide or narrow, nostrils small or open, lips thick or thin, chin round or pointed, can draw his horoscope, and determine his qualities, his vices and his talents.

As the temperament signifies the general constitution of the body, the influence attributed to it over the faculties and propensities, ought to be universal; but how does it happen, that there is scarcely any one, who is not passionately fond of some things, and wholly indifferent in regard to others? Why do we coldly and without regret give up one object, whilst we strive for the possession of another with untiring perseverance? How does it happen, that a person has astonishing power in one department, and extreme weakness in another, which he has cultivated even with greater assiduity?

Every man who sincerely aims at truth, may at any time convince himself, that the exterior, so far as it reveals the temperament, is not at all in harmony with the faculties and propensities. It is by no means true, that the activity of the vital functions is in direct proportion to that of the intellectual powers; if it were so, these turbulent idlers, debauchees, and jovial fellows, who are so lively, would far surpass, in intellect, men apparently much more calm and sedate.

Where are the functions of organic life more replete with vivacity than in fishes, birds, apes, squirrels, &c.? But are the intellectual faculties of these animals superior to those of man, who has less mobility, or those of other animals whose inferior animal functions are less active? The assertion equally false is, that men formed

like Hercules, always have great courage, and small heads, as Richerand maintains, 8th edit. t. ii. p. 121. Large men have large heads full as often as small men; and experience at all times proves that, men above the ordinary dimensions, are not less distinguished for moral and intellectual faculties, than those of inferior stature. In regard to courage, every observer will acknowledge, that, among other animals, as well as in our own species, the superior in magnitude are often surpassed by the more diminutive. The rabbit of our warrens, although much smaller than the hare, always conquers him; the fighting cock, much smaller than that of our court-yards, gains the victory. The wren puts to flight birds much larger than himself. Alexander, Pepin-le-Bref, and Du-Guesclin, were of diminutive stature. I ask, finally, whether the intellectual faculties and moral qualities of man can be reduced to four or six categories as his temperaments have been; whether, if a man, in other respects healthy, becomes insane, his temperament loses its influence; whether those born idiots should not be registered in some one of the rubrics resulting from the division of temperaments; finally, whether any attempt has yet been made, by means of the temperaments, to account for the propensities and mechanical aptitudes of animals. I would by no means deny, that the particular constitution and the existing state of health, modify the exercise of the intellectual faculties and moral qualities. It is evident, that, according to the state of our health, we are more or less active, more or less susceptible. The mode in which the intellectual faculties and moral qualities manifest themselves, is, therefore, modified by the temperament. But the admission of this modification is a very different thing from deducing a particular, determinate and fundamental quality from a particular temperament.* The

* Richerand thinks to oppose organology by the following remarks: "Reduce by bleeding this intrepid warrior who has braved death in twenty battles; you make him weak and pusillanimous; in vain will

state of our health evidently affects our five senses, and yet nobody has ever conceived the idea of deducing the sight, or hearing, from our constitution or our temperament.

From what has been said, it is manifest, that we are to seek in the brain only, for the cause of the inclinations, propensities, mechanical aptitudes, affections, passions, moral qualities, and intellectual faculties; that we cannot find it in the nervous plexus and ganglions of the chest, and lower belly, in the nerves and organs of the senses, in the whole body taken collectively, nor in the temperaments. There remains the brain only, the noblest of all nervous systems. Hence I have, thus far, proved negatively, that the brain must be exclusively recognized as the organ of the moral and intellectual powers. I now proceed to the direct and positive proofs of this assertion.

The brain is exclusively the organ of the instincts, propensities, sentiments, and talents, of the affective and moral qualities, and the intellectual faculties.

I shall not, in this part, adduce all the proofs of this proposition: I shall bring forward many of them in the treatise on the functions of the five senses, and in dis-

his cranium exhibit then the bump, which Gall is pleased to consider indicative of bravery."

This result must ensue according to every hypothesis, by which the exercise of the functions of the mind is made dependent upon any particular part of the body whatever. When every other part of the body is enfeebled, is it to be expected that the brain alone will preserve its energy?

Besides, Richerand may be reminded of Chevalier Bayard, who, oppressed by the pains of a long fever, did not cease to seek for battles, *and would not have lost, for ten thousand crowns, the good fortune* of fighting with the redoubtable Spaniard, Soto-Mayor. (*Vie de Bayard*, liv. ii. p. 93.) Who cannot recall a thousand other examples capable of proving to Richerand, that our warriors, weakened by their wounds and fatigues, were not the less vehemently urged on, till their last breath, by their ruling passions—glory and bravery?

cussing the origin of our moral and intellectual powers, especially in proving the dependence of their manifestation upon material conditions. What I shall say afterwards of national heads, and of the plurality of cerebral organs, in the particular exposition of the fundamental powers and the seat of their organs, will serve to confirm this principle. I shall here confine myself to some proofs, founded upon comparative anatomy and physiology, and upon pathology.

First Proof.

The gradual approach to perfection among animals, from those nearest to the vegetable kingdom, up to man, furnishes a proof, which would alone be sufficient to establish my assertion. In animal plants, zoophytes, and, generally, in all living beings without nerves, we as yet observe nothing analogous to a mechanical aptitude, an instinct, or a propensity. Human monsters, also, born without brains, are exactly in the same condition. Sensibility and its simplest phenomena appear with ganglions and nerves, which from them derive their origin. But yet these functions belong to vegetative life, to nutrition and motion.

In proportion as the ganglionic system is perfected, and a small brain is perceived above the oesophagus, we observe the manifestation of some instincts, and innate ingenuity. Bring the nervous system to a higher degree of perfection, furnish more acute senses, and a more perfect brain, and you observe, with admiration, the mechanical aptitudes and marvellous instincts of bees, ants, and other insects. By degrees you come to fishes, and amphibious animals, whose brains are generally composed of several ganglions, serving the purposes of the olfactory, the gustatory, the visual nerves, the fifth pair, &c.: the hemispheres of the true brain are yet very small, but varied according to the various faculties of the species. In birds, the hemispheres are much more

perfect, and the more so in proportion to the number of the qualities of the species. The brain of the hen is less perfect than that of the parrot. On coming to mammiferous animals, we find their brains more and more complex, according to the number and energy of their instincts, propensities, and intellectual faculties; the brain of a hare differs greatly from that of a dog; the brain of an ox from that of a horse. At last comes man, who is endowed with reason and liberty, and who is elevated above all the rest of the animal kingdom, wholly in consequence of the many cerebral parts bestowed upon him. To give some idea of the gradual difference in brains, I have delineated, in my large work, those of several different animals. Fig. 1, pl. xxxiii. represents the brain of a frog, with its spinal marrow; fig. 2, that of a hen; fig. 3, the brain of a kangaroo; and fig. 4, that of a lion; plate xxxix. fig. 1, the brain of an ape; fig. 2 and 3, that of an orang-outang. Plate iii. the brain of a calf; plate vii. the brain of a sheep. Plate iv. is intended to facilitate the comparison of all these brains with each other, and with that of man.

The gradual perfecting of the mechanical aptitudes, instincts, propensities and faculties, is, therefore, in direct proportion to the gradual perfection of the brain, and not at all to that of the other parts of the body, such as the viscera, the ganglionic nervous systems, &c. From this it necessarily follows, that the brain alone is the organ of all the qualities and all the faculties.

Second Proof.

The manifestation of the moral and intellectual powers cannot take place, except with the development and energy of the brain and its different parts.

In new-born infants, it is difficult to discover, without previous maceration in spirits of wine, any traces of fibres in the large masses of gray and reddish substances of the great cerebral ganglions, which strengthen and

perfect, or as others think, put into action the hemispheres. The nervous fibrils are visible in the middle and posterior lobes earlier than in the anterior. In the same manner, the fibrous structure is discernible, by the naked eye, in the cerebellum, only by degrees, and in proportion to its development. All the nervous fibrils, at this early stage, are so submerged in gelatinous substance more or less red, and among the blood-vessels, that the whole brain has the appearance of pulp or gelatine.

The only functions of a child at this epoch, are those of the five senses, which are as yet very imperfect, and that of voluntary motion, hunger, the sensations of ease and pain, and the want of sleep.

After some months, those parts of the brain situated towards the anterior and upper region of the forehead, increase more rapidly than the other portions. The forehead of the child, from its previous flattened form, projects forward, and it begins to fix its attention upon external things, to compare them, to form abstract ideas, and to generalize.

By degrees, the entire cerebrum becomes more and more developed until between the ages of thirty and forty, when it arrives at its maximum relative to each individual. The cerebellum also, which, relative to the cerebrum, is small in proportion to the degree of youth, is developed and perfectly formed between the ages of about eighteen and twenty-five. The youth of both sexes feel an interest for each other; the talents and propensities manifest themselves, are brought into action, and approximate towards perfection, until the age of complete maturity. From about thirty to forty, both cerebrum and cerebellum remains nearly stationary until the age of fifty, sixty, or seventy years, according to the individual constitution. The same takes place with regard to the moral and intellectual powers. In the mean time, certain cerebral parts, especially those situated towards the anterior and lower region of the forehead, have begun to diminish; and a more treacherous

memory, and a less ardent imagination first remind us of the approach of old age, and the decline of our faculties.

Finally, the whole cerebral mass gradually loses its nervous turgescence ; it diminishes, becomes meagre, and shrinks : the consistency of its two substances is changed. The moral and intellectual powers decline in the same proportion ; propensities and talents disappear ; the affairs of the world assume a different aspect ; for, times past only afford us any pleasure ; and at the age of decrepitude, nothing remains but the foolishness and weakness of second childhood.

Since the development of our propensities follows that of the brain, step by step, and these powers exist and decline in the same degree that the brain maintains or loses its perfection ; the brain must necessarily be the organ of our moral qualities and intellectual faculties.

Third Proof.

In some instances nature makes an exception to her usual course ; sometimes the intellectual faculties appear with all their vigor at the age of infancy. There are some individuals in whom the precocious development seems to extend to all the faculties ; in others, it is confined to one. On the other hand, we see examples of individuals, who appeared imbecile, until the age of twelve or fourteen, and who, nevertheless, after this epoch, have not only had their faculties unfolded, but have become distinguished men. How are these phenomena to be explained ?

The development of the rest of the body bears no proportion to that of the intellect ; *prodigies* are indeed almost always children of a feeble constitution. Those endowed with a particular talent for one department, for example, music or mathematics, are seldom physically different from other individuals at the same age.

It is very different with regard to the development of the brain. The precocious development of the intellectual faculties, is always accompanied by a precocious development of the brain ; these remarkable children therefore have very large heads.

The observations which I have had occasion to make during a long course of years, have convinced me, that when there is but one faculty prematurely developed, the organ of this faculty alone is found developed in the same proportion.

When the development of the faculties has been late, it is because there existed, previous to the epoch of development, a cerebral weakness, a disposition to dropsy, or a real dropsy in the brain, &c.

In treating of the innate dispositions, I have cited many examples which apply to what I have just said ; I shall adduce still more, when I treat of the plurality of organs, and of the fundamental qualities in detail. Every one must perceive, that these examples can be explained only upon the hypothesis, that the brain is the material condition of all the faculties, both moral and intellectual.

Fourth Proof.

Woman generally possesses certain qualities and certain faculties in a more eminent degree than man, whilst man has the superiority in regard to other qualities and faculties. The individuals of the same family or the same nation, are distinguished from each other, both with respect to moral character and intellectual capacity ; different nations have the same moral and intellectual character. Whence arise these differences ? Can they be explained by diversities in the viscera, the plexus, the nerves, or the ganglionic nervous system ? Certainly not. But study the different forms of the brain, the cranium and the head, and you will perceive a direct relation existing between these different propensities and talents, and the cerebral organization. You will

see that woman generally has the posterior part of the head more elongated than man ; that the latter has the higher and broader forehead. You will perceive, that different cerebral parts are more developed in some individuals than in others ; you will be convinced of the same circumstance in the brains and heads of different nations, and this information will reveal to you the material causes of phenomena so diversified. In treating particularly of the organs, I shall describe these differences in detail. All this proves, that the cause of the moral qualities and intellectual faculties must be sought in the brain.

Fifth Proof.

Neither the cerebrum nor the cerebellum is indispensably necessary to automatic or organic life. Even in different species of mammiferous animals, the upper part of both hemispheres, the great commissure of the two hemispheres, and indeed more than half of the hemispheres both of the cerebrum and cerebellum, may be cut, destroyed by suppuration or dropsy, compressed, affected by atrophy, or removed, without necessarily causing death or preventing the senses from performing all their functions. We see some children, born vigorous and thriving, who live some time, although from the first wholly destitute of brain. Some animals, as fishes, insects, &c. are endowed with an extreme vivacity, although their brain is exceedingly small. The activity of the brain of the fœtus, while in the womb, is very much restrained, and yet, in comparison with the other periods of life, the body of the child is very rapidly developed within the mother. During sleep, when the brain, in regard to its special functions, is at rest, the body continues to live, and all the functions of organic life are perfectly performed. In mental diseases, when the brain frequently suffers considerable changes, the vital functions often continue in all their activity. Insects, sala-

manders and tortoises continue to live a considerable time, after having been decapitated.*

Since the whole brain is not appropriated to organic life, to nutrition, circulation, the excretions and secretions, the voluntary motions, the functions of the senses; and since, of all the nervous systems, it is the most voluminous, and the most perfect, is it not natural to infer that its purpose must be the most noble, the most elevated, that of rendering effective the qualities and faculties which admit of explanation by no other system?

Sixth Proof.

In my endeavors to prove that the mode, in which the faculties of the mind manifest themselves, depends upon material conditions, I have relied upon the fact, that the faculties of the animal are essentially the same, whenever there is no essential difference in the structure of the brain. This proof serves, also, to show, that the brain is the organ of the mind. All human brains, if they are not naturally defective, exhibit the same parts and the same principal convolutions; they are distinguished from each other only by the relative proportions of the convolutions, and by some differences in accessory convolutions. Hence the reason why men, in all countries and in every age, have essentially the same propensities and the same faculties. All the differences in this respect are but slight. Hence, as I find in the brain of the negro, the same parts as in that of the European, it is certain, that they both occupy the same degree in the scale of the animal kingdom.

If, at some future day, naturalists should become better acquainted with the structure of the brains of animals, they may perhaps find in the brain the surest principle for the division into genera. All the species and all the

* *Semmering Hirn und Nervenlehre*, p. 368, etc.
10*

individuals of the same family have essentially the same brain; for the principal convolutions do not differ. The brain of the lion or the tiger, in regard to its principal convolutions, is the same as that of the cat; the brain of the wolf, the same as that of the fox, the dog, and all the canine varieties, whatever differences may be found in the external forms of these animals; for, how remarkable is the difference between the form of the terrier and that of the grey-hound! Therefore the essential qualities of these species are the same, and the differences observable in the faculties of the varieties, arise wholly from the various degrees of development in the different cerebral parts, as I shall show, when I treat of the primitive powers and their organs. All mammiferous animals, with some modifications, have the same viscera; therefore, if the intellectual faculties and moral qualities depend upon the viscera, they should all have the same faculties and the same qualities. In all cases, when animals are found to have different qualities and faculties, comparative anatomy observes essential differences in their brains. These circumstances furnish an irresistible proof, that the brain alone is the organ of the intellectual faculties and moral qualities.

Seventh Proof.

Every one knows, that the operations of the mind take place in the head. The impressions, and the ideas which give rise to the affections or excite the passions, have their seat in the brain. An excessive exertion of the mind particularly, fatigues, exhausts and irritates the brain; and, if it is continued too long, one at last imagines, that, with his eyes shut and in obscurity, he sees external objects so distinctly, that he can with difficulty dispel the illusion; from thence follow watchfulness, pains in the head, vertigo, syncope, apoplexy, weakness of the stomach, inflammation of the brain, acute and chronic hypochondria, paralysis, &c. &c.

When one is afflicted with headache, every thing that fixes the attention or requires intense thought, instantly augments the pain. When the brain is enfeebled, or rendered too irritable in consequence of an injury, a disease, or a violent concussion, the least application causes headache, or occasions a tension or burning heat in that part. A man, after having been cured of a wound in the brain, still experienced a dull pain, and itching, and a sensation of torpor in the region of the wound. The least application increased this pain : the torpor in this case extended to the other side of the head ; if the exertion of mind was prolonged, he felt pains more and more acute, until at last he became delirious, and the whole of one side was paralyzed.

Eighth Proof.

The experience of all ages proves, that when the moral qualities and intellectual faculties are exercised with much energy, there is almost always a great development of the brain or of some of its parts. The ancients, indeed, if they wished to represent a man endowed in a high degree with the most noble intellectual faculties, give him a very elevated forehead ; because the intellectual faculties of the soul are seated in the anterior and upper part of the head, (compare the cranium, pl. xxx. of a man distinguished for his talents, with those of idiots already cited;) in this they were apparently guided by observation. If they represented a wrestler, a Bacchus, a Silenus, &c., they placed all his faculties in the posterior part of the head, and in the nape of the neck. As I have already treated of this subject in the first volume, and shall subsequently consider it in all its details, I shall at present dismiss it without any farther observations.

Ninth Proof.

On the other hand, when I spoke of the influence, that the state of the organs has upon the mode in which the moral and intellectual faculties manifest themselves, I cited several examples of defective, incomplete organization of the brain; and I observed that this imperfection was always accompanied with a proportionate imbecility.

The brain, described by Willis, pl. xviii. fig. 2; two others, examined by M. Bonn, at Amsterdam, pl. xix. fig. 1; a fourth, the cranium of which is in the possession of M. Pinel; a fifth of the same kind, found in the collection of the School of Medicine at Paris; two similar ones, in my own collection, pl. xviii. fig. 1, and pl. xx. 1, 2, belonged, without exception, to persons completely imbecile from birth. These brains contained not more than a fourth or fifth part of the ordinary mass in man, although the individuals had attained the age of seven, eleven, twenty and twenty-five years.

When the imperfection is less marked, the imbecility is less complete in the same proportion. At Heidelberg, a girl nine years of age, whom I mentioned when treating of the innate dispositions, had about half the usual cerebral mass; she showed affection for her relatives, played, without knowing any better, with the most insignificant objects, talked in broken phrases, &c.

A boy sixteen years of age, living at Hamburg, had the inferior-anterior parts of the forehead well developed, but the whole forehead was scarcely an inch in height, so that the anterior and superior frontal parts were either wanting or had not been developed. He learned names, numbers and history, and was able to recite mechanically what he had learnt. But he was absolutely devoid of the faculty of combining, comparing, judging, &c. I have seen a similar instance at Paris.*

* Richerand cites two similar cases, *Nouveaux elements de Physiologie*: 7^e édition, t. ii. p. 193. In treating particularly of the fundamental

As this defect of the brain was not accompanied by any defect in other parts of the body, except such as are met with in others as often as in idiots, the imbecility more or less complete of such individuals, must be attributed to the imperfect development of the brain, which, therefore, ought to be considered as the organ of our moral qualities and intellectual faculties.

Tenth Proof.

Provided the brain is left untouched, all the other parts may be affected by disease, or separately destroyed; even the spinal marrow, at a certain distance of the brain, may be compressed or vitiated, without immediately injuring or annihilating the functions of the mind. In madness and tetanus, when it is caused by wounds, we sometimes see the intellectual faculties and moral qualities continue in all their vigor until death, although the nervous systems, except the brain, are most violently affected. I shall have occasion, hereafter, to speak of the influence, which diseases of the viscera have upon the brain.

Eleventh Proof.

If, on the contrary, the brain is compressed, irritated, injured or destroyed, the intellectual functions are either modified and totally or partially deranged; or they cease to exist altogether. A man who suffers these accidents, falls asleep, becomes insensible, stupid or insane; a cerebral inflammation produces delirium or stupor. If the disorder of the brain disappear, the compression be

qualities, I shall show that the anterior-inferior parts of the brain perform the functions here attributed to them, and that the anterior-superior parts, on the contrary, are destined for the more noble faculties.

removed, the extravasated blood or the pus be evacuated, or the cerebral inflammation allayed, consciousness and the power of thought revive, and sometimes even instantaneously.*

These considerations are of the greatest importance to the medical art, especially in judging of mental diseases; and as they afford me, at the same time, an occasion to rectify the uncertainty which exists in the works of physicians and physiologists, in regard to the seat of alienation, I shall stop to avail myself of some examples, in which the viscera can have no influence upon the brain; which examples, consequently, fix our ideas relative to the seat of derangement, irrevocably in the functions of the moral qualities and the moral and intellectual faculties.

Hildanus reports the case of a boy, ten years old, whose skull had been depressed by an accident; as no particular symptoms appeared, no remedy was applied to the depression. In the mean time, this individual, who had previously shown excellent capacities, gradually lost his memory and judgment: he became completely stupid, and remained so until he died, at the age of forty.

Another boy, about nine years of age, was attacked by a violent pain in the head, accompanied by fever; the cause of his disorder was probably misunderstood: he recovered by degrees, but very imperfectly. Soon after he was observed to lose gradually his former vivacity, and the amusements of his age no longer interested him. Although, previous to his sickness, he had manifested pretty good abilities, he was now far from satisfying the expectations of his parents and teachers. He frequently had convulsions, and in sleep he generally kept his head drawn back: the physicians who were consulted, supposed that he had worms; but I regarded

* M. Scemmering has already adduced a part of these proofs, i. c. p. 371.

his malady only as the consequence of a cerebral inflammation which had been neglected: he died, at the age of thirty, in the institution of Vienna, called Theresianum. On opening the body, we found no worms; but all the superior anterior part of the brain, where he had previously experienced pains, was covered with a great number of pseudo-membranes and purulent substances; the cerebral mass was eroded, and the corresponding part of the cranium was more compact and thicker than the rest.

Blanchard, the aeronaut, fell and struck his head; from that time he was subject to attacks of apoplexy, and to a general weakness of the mental faculties: he seemed to have only a confused recollection of his former talents, and he died, at the age of fifty-three, in consequence of an apoplectic fit.*

In a case of autopsy we found the meninges adherent and thicker than usual: among other derangements of the brain itself, we found, as I had predicted, several foci of suppuration in the middle lobe.

A lady of fine talents, in a fall, struck the back part of her head against the mantel-piece of a fire-place. After this fall, she was subject to periodical fits of mania, and insensibly lost all her brilliant qualities. That part of her head, which had been struck, was constantly hot, and, in her paroxysms, she mechanically placed her hand upon the suffering part: at last her malady degenerated into insanity.

At Pforzheim, in the grand duchy of Baden, I saw a man, who, at the age of six years, had broken the whole of the fore part of his skull: he had been cured of his wound, but from that period he was subject to periodical fits of madness.

Another man, living at Weil, near Stuttgart, had his skull broken in by a blow from a stone. Before this accident he had been known as a peaceful citizen; but

* Gazette de Santé, de 1807, 21 mars, p. 71. Autopsie, Blanchard.

after his convalescence, people saw with surprise that his character was wholly changed: this man, previously so mild, had become quarrelsome, and excited contentions; his cranium, which I preserve in my collection, is thick and very dense, and proves, by mere inspection, how much the brain had suffered.

Richerand attended an old woman, whose brain had been to a considerable extent laid bare by caries. One day, while cleansing away the pus, he pressed downwards a little more forcibly than usual; immediately the patient, who, an instant before, answered his inquiries very correctly, became silent in the middle of a sentence: the respiration and the pulse continued: as this pressure occasioned no pain, he repeated it three times, and always with the same result. Each time the patient recovered her faculties, the moment the pressure ceased.

A man who had been trepanned for a fracture of the cranium, perceived, that, in proportion as the pus accumulated in the interval between the removal of successive dressings, his faculties declined, and the consciousness of his existence became more and more enfeebled.*

Esquirol mentions the following cases, in which blows upon the head preceded, many years, the manifestation of the delirium. A child three years old, fell and struck his head; afterwards it complained of the headache; it grew up, and at the age of puberty the pain in the head increased, and insanity appeared at the age of seventeen. A lady, returning from a ride on horseback, struck against a gate, and was thrown from her horse; some months afterwards she became insane, and was cured, but died, at the expiration of two years, of a brain fever.

Similar facts induced Boerhave to maintain, that when the brain is pressed by the bones of a fractured crani-

* *Nouveaux Elémens de Physiologie*, 7 édit. t. ii. p. 195 et 196.

um, the consequences are vertigo, drowsiness, and the loss of consciousness. Morgagni, Haller, and others, cite in their works many instances, in which inconsiderable injuries of the brain disturbed the exercise of the intellectual faculties.

In all the cases which I have hitherto mentioned, the rest of the body was in a healthy state; consequently the phenomena observed, cannot be imputed to any foreign influence. These facts prove, then, in an irresistible manner, that the manifestation of the moral and intellectual faculties essentially depends upon the brain.

Cases, in which an injury or violent concussion of the brain has awakened into exercise all or some of the intellectual faculties, still further confirm what I have advanced. The account given of Mabilon, (already cited in the first volume,) is well known. Until his eighteenth year, he could hardly talk, and could neither read nor write. On account of a fall, it was found necessary to trepan him; during his convalescence, Euclid fell into his hands, and he made a very rapid progress in the mathematics; so certain is it, that a simple irritation of the brain is capable of exciting the moral and intellectual faculties.

In the same volume, I have reported the case of two boys of small capacities, whose powers were developed by a fall. Even the moral character of one of them suffered an unfavorable change.

In the same part of my work, I have spoken of a young man trepanned by Acrel, who, before his mishap, had felt no inclination to theft, and who, after his recovery, was impelled to it by an irresistible propensity.

Haller mentions an instance of one born an idiot, who, by a wound on the head, was cured of his imbecility, but who relapsed into his former state after his wound had cicatrized.

In these cases, also, we cannot suspect the brain to have been influenced by any viscus whatever.

Twelfth Proof.

I shall add some further observations, to prove that insanity has also its immediate seat in the brain. This point demonstrated, will demonstrate with equal force that the moral and intellectual functions are seated in the brain; since functions in their healthy state can have no place, except where the derangement of them manifests itself.

Mania generally arises from causes, which act immediately upon the brain. Such are a concussion, a wound, an inflammation of the brain, an organic disease of the brain itself, or of the meninges, an asperity on the internal surface of the cranium, a uniform and too long continued exertion of the mind, a project long pursued which happens to fail, disappointment in a long cherished hope, unbounded pride or ambition, wounded vanity, frustrated love, jealousy, exalted ideas either religious or superstitious, excessive circumspection and timidity in the execution of a project, a contest between principle and sensuality continued to excess; in a word, the numerous moral causes. "Hence it happens," as Pinel very judiciously remarks, "that persons of either sex, endowed with an ardent imagination and profound sensibility, those susceptible of the strongest and most energetic passions, are most disposed to mania, unless a sound, active, and energetic reason has learnt to counterbalance this furious impetuosity; a sad reflection, but invariably true, and well calculated to excite an interest in favor of those who unfortunately suffer under an alienation of mind."*

For the same reason, the experience of all ages proves that ecclesiastics, monks, artists, for example, painters, sculptors, musicians, and poets, lawyers, especially when

* Sur l' alienation mentale, 2d edit. p. 141.

they indulge in excesses of any kind, are more subject to mania, than those whose occupations offer greater variety and allow more tranquillity of mind, such as naturalists, philosophers, chemists, geometers. This accounts also for the fact, that all those predominant opinions, prejudices, and great events which engross the whole attention, which act powerfully upon the moral nature of man and deeply interest the mind, and which favor fanaticism, political or religious, so often produce mania.

The usual termination of incurable mania proves, with equal force, that its immediate seat is in the brain. When it continues many years, the cerebral mass is diminished, the cavity of the cranium contracts, and incurable dementia is the result. If, at the commencement of the disease, remedies too debilitating have been used, as very frequent and contraindicated blood-letting and purgings, it often degenerates into dementia. This imbecility of mind, in some manner artificial, is not always absolutely incurable; sometimes it yields to a more moderate remedy, sometimes nature herself effects a cure by means of a violent fit of frenzy or fever, &c. In all these cases, upon examination after death, the brain and cranium exhibit the most unequivocal marks of the changes that have taken place, as I shall prove in treating of the influence of the brain upon the cranium. What proves still more evidently that this dementia, and consequently the preceding mania, had their seat in the brain, is, that as soon as the mania manifests itself, the functions of vegetative life operate with more than usual activity. The person sleeps better, has a better appetite, digests more easily, and gains flesh; all the vegetative functions, in short, are better performed than ever, whilst the brain is deteriorated and its functions enfeebled. If dementia had its seat in any part appertaining to vegetative life, ought it not to disappear in proportion as vegetative life recovers its activity?

What adds weight to my assertion, is the fact, that mania is frequently accompanied by paralysis and apo-

pletecic symptoms, and experience proves, that, in all these cases, it is incurable; and undoubtedly for this reason, that the first cause of the disease is constantly augmenting, and the vital injury produces successively organic injuries, effusions, agglutinations, adhesions, and compressions which daily become aggravated.

Finally, the kind of death which maniacs suffer, affords to the enlightened physician an irresistible proof, that mania, in all the pathological forms which it assumes, has its seat in the brain. Apoplexy, paralysis, epilepsy, cerebral inflammations, nervous fevers, both acute and slow, most remarkable changes in the viscera of the thorax and abdomen, are maladies which attend a wound, concussion or inflammation of the brain. These changes are a necessary consequence resulting from debility in the functions of the parts affected, and of all the cellular tissue; a debility which occasions a diminution of all the solids and fluids, and which is followed by the scurvy, obstinate diseases of the skin, sloughs, carbuncles, gangrene, cancerous ulcers, decomposition of the fluids, and involuntary discharges.*

Observations upon the objections to the doctrine, that the brain is exclusively the organ of the moral qualities and intellectual faculties, and upon the doubts opposed to it. Refutation of these doubts and objections.

I shall continue the subject upon which I have been occupied, and begin by refuting the objections to the assertion, *that insanity has its immediate seat in the brain.*

To prove that the seat, both of the regular functions of the mind and of their derangement, is in the brain, I have cited many cases, in which injuries of the brain have been followed by derangement of its functions. It

* Dictionnaire des Sciences Médicales, t. xvi. p. 209. Esquirol.

is pretended, that an equal number of observed cases may be arrayed against me, in which the most considerable injuries of the brain have not induced the least derangement of the mental faculties. A man was shot in the head ; the ball was arrested in the brain ; after his death it was found upon the pineal gland, nearly in the middle of the cerebral mass. This man, however, had lived many years, without experiencing the least diminution in the vigor of his mental faculties.* A boy, eight years of age, had his skull fractured by the kick of a horse ; there came out pieces of the cortical substance larger than a hen's egg ; this individual was healed of his wound, and his mental faculties suffered no injury.† Another boy, seven years old, fell from a horse, and made a large opening in his head, from which issued excrescences of the brain that were constantly renewed ; his mental faculties did not experience the least alteration, and yet the ulcers had penetrated even into the substance of the brain.‡ A youth, fifteen years old, received a blow from a stone upon his head ; the brain became black and protruded from the wound ; being intoxicated with wine, he tore off the dressing, which brought away with it a large portion of the brain ; it was found vivified as far as the great commissure of the two hemispheres ; the patient became paralyzed, but his mental faculties did not suffer in the least.§ A girl, aged thirteen, in a violent attack of the cramp, lost two ounces of cerebral substance through an imperfectly cicatrized wound in the head ; all her limbs were indeed paralyzed ; but she retained her judgment and the faculty of speech until the fifth day, when she died.|| A boy, who had a wound upon his head, lost, in the space of four months, a considerable quantity of brain, by excrescences which

* Mémoires de l' Academie de chirurgie, t. i. p. 134.

† Mémoires de l' Acad. de chirurgie, t. i. p. 126.

‡ Van Sloeten, t. i. p. 440.

§ Mémoires de l' Academie de chirurgie, t. i. p. 2—150.

|| Medical Essai, t. ii. p. 245, 249.

were often removed ; at the seat of the wound, the cortical part was wholly destroyed ; the space, partially void, was completely enveloped with pus, and yet the patient talked rationally till the moment of his death.*

Mr. Tupper relates the following facts :

A child, six years old, received a pistol-shot in his head ; a suppuration followed, which, every time the wound was dressed, caused the discharge of a large quantity of cerebral substance. The child died at the expiration of eight days, having retained his faculties to the last moment. The head, being opened, did not contain a portion of brain larger than a small hen's egg !!

Another, after a disease of twelve years, died without ever having been deranged. After his death, the whole cerebral substance was found so soft, so filled with water, that it could not be cut without great difficulty. The spinal marrow was also very soft, and had lost half its volume.

Mr. Tupper, who cites these observations from M. Ferriar, who makes use of them to confound materialism, and to prove that the mind exercises its intellectual and moral powers independently of organization, quotes M. Ferriar's own words.

"A girl died on the fourth month of an arthritic disease, with evident signs of a compression of the brain ; but her intellectual faculties remained unimpaired. On removing the scalp from the cranium, before opening the dura mater, I was surprised at the flaccidity of the brain. It seemed but imperfectly to fill its membranes, and offered but a slight resistance to the touch. The patient had been dead only twenty-four hours. We found the ventricles filled with water, and an effusion of blood on the right side of the tentorium. But the principal malady appeared to consist in a total change in the consistence and color of the entire brain. It was im-

* *Nau Swieten*, t. i. p. 440.

possible to handle it or cut it; every thing was in extraordinary confusion." * Lallemand speaks of an examination, reported by Diemerbrœk, of a female domestic, "who experienced a comminutive fracture on the right side of the coronal suture, occasioned by a stone at least thirty pounds in weight. Fragments were forced in, and the brain was wounded. Two days after the extraction of the fragments, the brain being laid bare, began to issue through the wound, gradually acquired the volume of a goose egg, and separated, diffusing an infectious odor. A new portion of the brain protruded, sloughed, and was replaced by another; so that in the course of the treatment, a portion of the brain as large as one's fist, was destroyed by putrefaction. Nevertheless, the patient lived thirty-six days, and during all this time retained the use of her reason, and the functions preserved perfectly their action, except that only the whole left side of the body, opposite the wound, was affected once or twice with convulsions, and remained constantly paralyzed from the first; she also had the hiccups.

" After death, a large cavity was found in the brain, instead of the portion which had issued from the wound. The putrid affection had extended even to the ventricles of the diseased side. In this case there is no doubt of the existence of gangrene.

" The symptoms were the same that we have observed in almost all other cases of inflammation of the brain, except the continuance of reason till the last moment; for that side of the body opposite the disease was affected with intermittent convulsions and paralysis."

Authors have carefully collected such examples, either to contradict the received principles of certain physiologists, or because they are fond of the marvellous, and are not sufficiently impressed with the principle, that the exercise of the intellectual faculties is impossi-

* Inquiry into Dr. Gall's System, p. 752.

ble without organization, and especially the organization of the brain.

It is said, that there are instances equally numerous, in which the mental faculties were deranged in a very striking manner, and yet no disease was observable in the brain. Other cases also are cited, in which irritation that had its seat in the stomach, the intestines, the liver, or in any other part beside the brain, has produced considerable derangements in the mental faculties.*

It is inferred from these facts, that, if an injury or disease of the brain induces derangements in the mental faculties, this by no means authorizes the conclusion, that the brain is exclusively the seat of these faculties.

To rectify these facts, partly true, partly false, and to appearance contradictory, we must begin by resolving the two following questions: 1st. Have individuals, hitherto, been qualified to determine, with accuracy, the imperfections, injuries, and diseases of the brain? 2d. Have they been capable of fully appreciating the consequent effects?

Have individuals, hitherto, had the knowledge necessary to determine accurately the imperfections, injuries and diseases of the brain?

It is impossible to make accurate pathological observations upon a part, of whose structure we are ignorant, and upon which we have only false ideas.

Richerand rejects the observations made by Greding, upon the brain of deranged persons, because, says he, this observer was not sufficiently acquainted with the organization of the brain.†

Yet from the time of Greding to that of Richerand, the knowledge of the brain has not undergone any re-

* *Pinel, de l' Alién.* ment. p. 453 et 454.

† *Physiologie,* 7th édit. p. 191.

markable change. Greding speaks of the brain, in the same spirit as those at present speak of it, who think they must disdain our discoveries. He designates all the parts with the same names as are used by anatomists of the present day : we have proved, in its proper place, that the structure of the brain was not better known in France than in Germany. Besides, Greding recorded so great a number of autopsies, that he was able to arrive at indisputable results. It is now but a few years, since the autopsies of the French physicians, far from being sufficient to establish the principles of the German observer, were insufficient even to verify the accuracy of them.

What knowledge of the pathology and physiology of the brain, can we suppose anatomists of the present day to possess, when we see Malacarne, Reil, and Tiedemann, maintain, that the cerebellum is composed of a less number of follicles, than that of persons who have their mental faculties entire ; when we see cases of common hydrocephalus continually cited, in which the cranium is entirely destitute of cerebral substance, and filled with water only ; when we see others coincide with Morgagni in the assertion, that a cerebral substance too firm, occasions incoherence of ideas, and when it is too soft, sluggishness of ideas, and consequently fibres too tense produce insanity, and fibres too lax, imbecility ? People also speak with Dumas, of the rounded form, which they pretend to observe in the brain of persons endowed with remarkable intellectual faculties, of a more or less deep color of the brain, according as the inclinations of the deceased were more or less mild. Others, besides Dumas and Richerand, find the brain indurated after death. The account related by Theophilus Bonnet is still copied, according to whom the brain of a man, who, after having a delirious fever, had become maniacal, was found hard, dry, and friable between the fingers : it is still maintained, that deranged persons remarkable for their obstinacy, had hard and tough brains, whilst those of a flexible character had soft brains. In accordance

with Portal,* the brains of deranged persons are still found to have convolutions less deep than those of other men. The same author pretends to have seen the cerebral cavities invested with the vascular membrane only, so that the least incision made in this membrane, penetrated into the lateral cavities.† We yet hear men continually speaking of cerebral dissolution in hydrocephalus, of ossified and even petrified brains.

In my numerous investigations of the brain, I have never found any similar phenomena; with the exception, however, of one single well-formed cranium, of a still-born child, which I found filled with water, without being able to observe the least trace of a brain. If physicians, who allow themselves to be dazzled by the splendor of certain names, find nothing similar in the brains of deranged persons, does it follow that these brains have suffered no deterioration whatever?

If one is not accurately acquainted with the structure of the brain, he may frequently suppose, that an injury, a fungus, or a hydatid which he discovers, is found in the fibrous part of the brain itself, while it really exists only between the convolutions, or between the two hemispheres. How frequently do authors tell us, that pieces of the gray substance, a cubic inch in magnitude, or even as large as a hen's egg, have protruded from the cranium! and yet throughout the surface of the brain, the gray substance is scarcely a line in thickness. Sometimes it is thought, that this same substance is destroyed, when it is only discolored. In blindness, it is pretended that the optic thalami are affected with atrophy; but we have proved, that the optic nerves do not arise from the optic thalami, and that consequently atrophy can extend to the optic nerves only, which are merely adherents to the pretended optic thalami. In diseases of the optic nerves, a diminution in the anterior pair of the quadrigemina is never mentioned, although we have seen nume-

* *Anatomie medicale*, t. iv. p. 67. † *Anatomie medicale*, t. iv. p. 76.

rous instances of it.* We hear much said about regeneration of the cerebral substance, excrescences of the brain in wounds of the cranium; and all seem to be ignorant of the fact, that, when the convolutions are unrestrained by any external resistance, they unfold themselves and penetrate through the opening; this is the reason why, in such cases, we find the cerebral cavities enlarged. I saw, in a boy, thirteen or fourteen years old, a cerebral hernia, caused by a blow upon the head, which had produced a separation of the bones of the cranium; the physicians were so confident that it was water between the meninges and the brain, that they advised a puncture, which would surely have caused immediate death. What confidence can we have in accounts of diseases and imperfections of the brain, drawn up by men who are so far behindhand in regard to pathological knowledge?

If, in some mental diseases, no discernible unsoundness is perceived in the brain, it does not prove that there really exists no alteration. What anatomist perceives any change in the fibres of the brain, or in the nerves, when these parts become paralyzed? Is any alteration perceptible in certain kinds of convulsion, in tetanus, violent concussions of the brain or spinal marrow, in the extinction of all irritability, by violent affections or by lightning? When the gout, measles, and scarlet fever attack the brain, are any traces of their miasmata discoverable in that organ? Finally, are not the functions of other parts frequently as much disturbed as those of the brain, without a possibility of discovering any sensible vestige of this derangement?

Let physiologists and physicians place themselves in a more elevated point of view; let them consider, that the subject of their observations is not a lifeless machine, in which all the derangements must manifest themselves

*Anatomie des nerfs des sens, t. i. p. 62 et 83. édit. in-fo; p. 115 de édit. in 4.

by visible, mechanical, or organic imperfections! We have to do with life; we shall never ascertain what life is; consequently, we can never, by means of our senses, know what disturbs or causes it to cease. Mechanical or organic derangements are subordinate to those which affect life: the former are mere consequences of the latter; and the life of a part or the whole of the body, may be attacked without any visible organic derangement.

This shows why, when a mental disorder has been of short duration, it frequently happens that not the least trace of it can be found by an examination of the remains; whilst, on the contrary, when the same kind of alienation has been of long continuance, the most marked changes are perceptible in the brain, the meninges, and the cranium: for instance, ossified vessels, a diminution of both cerebral substances, deposition of osseous matter on the internal surface of the cranium, excrescences of the cranium, &c.; results of a change inappreciable by the senses, which that power has undergone, upon which life and its functions depend.*

Sometimes, indeed, considerable injuries of the brain do not disturb its functions so much as might have been expected, and at others, the slightest injuries are followed by the severest effects. But the same thing occurs in other parts: we frequently find in the lungs large sacs of pus, without the respirations having been sensibly incommoded, or the health having sensibly suf-

* M. Royer-Collard (*Bibl. Médicale*, April, 1813) is therefore under a mistake when he says, "After a fall upon the head, which happened to the patient in his infancy, the hemiplegia which this fall had occasioned, the continued weakness of the whole left side, and the mental alienation which manifested itself after all these accidents, was it not natural to regard this alienation, as the effect of an organic injury of the brain? Does not this opinion appear incontestably confirmed by the nature of the alienation, its uniform course, and its almost-evident incurability? But what is most astonishing, is the perfectly sound state of the cerebral system." Fodré is equally wrong, in concluding from similar facts, "that the brain is not primitively injured, on the appearance of the first symptoms of insanity, and that it ought to be considered only as a secondary organ."

fered. Even ossifications have been found in the heart, and yet the individuals never complained of any indisposition during their life. Who would infer from these facts, that the lungs are not the organ of respiration, or that the heart is not that of circulation?

When the irritability or the excitability of the patient is not great, considerable wounds frequently produce no very marked symptoms. On the contrary, when the irritability is excessive, the least injury is followed by the most tumultuous derangements. Physicians have every day opportunities to verify this remark. Every one knows, that doses of medicine should be proportioned to the irritability of the patient; a grain of emetic produces the most violent vomiting in one patient, while four or six grains affect another very faintly. The smallest doses of mercury produce in one a very violent mercurial fever, whilst ten times the quantity produces scarcely any change in the functions of another. Therefore, what pertains to the constitution of the patient, ought not to be attributed to the nature of the disease. From all that has been said, it follows, that very little confidence can be reposed in the reports of physicians upon the imperfections, diseases, and injuries of the brain, so long as the authors neglect to make themselves acquainted with the most recent discoveries upon the structure and functions of the brain. I proceed to the examination of the second question.

Have individuals, even up to the present time, been sufficiently enlightened, to judge accurately of the influence which the imperfections, maladies, and injuries of the brain exercise upon the intellectual faculties?

No one ought to be more strongly impressed with the insufficiency of the notions which have hitherto prevailed, in regard to the intellectual faculties, and the derangements of the faculties, than a physician who undertakes to treat of mental diseases. Mr. Haslam says, "Until

we are better acquainted with the functions of the brain, and each of its parts, we shall be incapable of judging correctly of the derangements incident to these functions, and assigning their degrees." Dr. Powel complains of the imperfect state of our knowledge, relative to the diseases of the brain and the whole nervous system. Pinel despairs of our ever being able to distinguish the different species of alienation ; because we are too little acquainted with the functions of those parts in a state of health, the derangement of which occasions alienation.* But why does this learned man, otherwise so distinguished, appear to condemn the researches upon the functions of the brain ? I take this occasion to show, that it is only by the aid of these researches, that physiologists will ever be able to remove the difficulties, and extricate themselves from the contradictions, in which they are incessantly involved. The solution of the problem in which I engage, will afford an answer to the question—Where is the seat of mania, dementia, and imbecility ?

I pass over in silence those cases, in which physicians like Everard Home have unphilosophically confounded the phenomena of vegetative life, and the inferior phenomena of animal life, with the moral qualities and intellectual faculties. I shall content myself with examining the spirit of those observations, according to which considerable defects, or serious injuries of the brain, have not occasioned the derangement of one of the higher intellectual faculties.

What I have said above, upon the just appreciation of the morbid changes of the brain, is also applicable in this place. To judge correctly of derangement in the intellectual and moral faculties, we must have an accurate knowledge of these faculties. But it is certain, that hitherto very few philosophers have had any correct ideas of the primitive faculties of the mind. I have

* Observations on Madness, p. 237.

already proved this assertion in the first volume, while treating of the animal life of man and other animals, or the special functions of the brain. No philosopher, till the present time, has had sufficiently clear ideas, or sufficiently comprehensive views on this subject; to point out the errors, in the received notions, and to define in a satisfactory manner, the primitive faculties of the mind, or the different functions of the brain. It is, however, only through the aid of this knowledge, that we can properly appreciate the consequences which must result from imperfections or injuries of the brain. It would be digressing from my design, to go into a full examination of this matter here; I shall merely offer to the reader the following observations.

All the accounts of diseases or injuries of the brain, which did not, as is said, occasion derangement of the mental faculties, may be reduced to this: The patient walked, ate, and talked; he did not lose his reason, that is to say, was not delirious; he retained his memory and his judgment, and, consequently, had lost none of his mental faculties. A man had the anterior part of the os frontis fractured by the kick of a horse; although stunned, he answered slowly, and in an interrupted manner, the inquiries of the surgeons. Several hydatids were found in the brain of a camel, which had never ceased to eat or recognize its conductor. Therefore, this man, and this animal, had lost neither consciousness nor any of the intellectual faculties.

Lallemand speaks of examining a brain, which had received an injury on the left side: a large part of the cerebral substance had protruded; the upper and lower limbs on the right side were paralyzed; the sight and hearing on the same side were impaired; and he adds, "It is quite remarkable, that this incipient paralysis of the organ of sense, should have been confined to the paralyzed side of the body; and because it is certain that the patient saw with one eye, and heard with one ear, we must suppose that he retained his understanding!"

I repeat with Lallemand, that all the facts of this kind resemble each other so much, that it would be useless to multiply citations, and I refrain from them the more readily, because the greater part of them, having been examined only under a purely surgical point of view, want the most important details relative to the symptoms, and especially relative to the injury sustained by the moral and intellectual powers. And what confidence can be placed in such citations, made expressly with the intention to prove the manifestation of the intellectual and moral faculties, without regard to material conditions, and thus, by a misunderstood course of reasoning, to refute materialism?

The conclusion, intended to be deduced from such facts, would be true, if consciousness, memory, recollection, and judgment, formed alone the sum total of all the intellectual and moral powers of man and other animals. Many animals evidently possess consciousness, memory, and recollection; they often judge very correctly of what is passing around them; but do they therefore enjoy all the moral and intellectual faculties of man? If a man, therefore, by a defect or disease of the brain, were degraded to the state of a dog, or an ape, could it be said that he had lost none of his faculties?

Mr. Tupper, who thinks that, with the loss of any cerebral part whatever, some function of the brain is lost, always uses such general expressions as *reason*, *intelligence*, *faculties*, *some mental alienation*, &c. He never designates a propensity, a talent, or a definite sentiment.

Have those, therefore, who, after a concussion of the brain, an attack of apoplexy, or a cerebral inflammation, cannot remember names, but who recollect every thing else, and retain their judgment entire, experienced no loss?

When one man, whose character had been pacific, became quarrelsome, after having received a blow from a stone on the head, which laid open his skull; when another, whose previous inclinations had been honest,

after having been wounded upon the head, experienced an irresistible propensity to steal ; can we say of these individuals, who certainly retained their consciousness, memory, judgment, &c., that their wounds had exerted no influence upon the manifestation of their moral and intellectual faculties ?

If, in our inquiries relative to the loss of cerebral functions, we regard nothing but consciousness, memory, and judgment, hardly any cases will be found, except those of complete imbecility and dementia, in which it may be said, that the intellectual or moral functions have been disturbed, or that there exists mania ; for the most frantic maniacs retain consciousness, memory, recollection ; they commonly judge, with correctness, of their sensations, and their imagination is frequently quite vivid.

What shall we say, in short, of those cases, in which a man is insane relative to one object only, and perfectly rational in regard to all others ; or entirely rational with respect to one object, and insane with regard to all others ? In both cases, then, consciousness, memory, and judgment, are unimpaired, and in both cases these faculties are deranged.

Suppose a patient has lost one or several of the primitive or fundamental faculties, for example, that of music, how can we ascertain whether the disease has occasioned its loss ? How shall we make the experiment relative to each special faculty, to convince ourselves of its presence or absence ? What means are there of proving in animals the loss of one of these faculties ? We see that captivity alone is sufficient to shackle the instincts and mechanical aptitudes of animals ; and shall we confidently decide upon the state of animals grievously mutilated ?

Can the patient himself instruct us ? That is impossible, except when he has only partially lost a particular faculty, or when this faculty has only been enfeebled. A short time ago, an officer severely wounded above one of his eyes, complained to me that he had lost the recollection of names. But, as I have already

said, it is probable that, when an organ has completely lost its activity, the recollection of the particular kind of impressions, which this organ transmitted to us, becomes impossible.

What shall we say, when there is not an entire cessation of any particular faculty or quality, but a diminution of energy in all, as is the case in decrepitude?

"No importance," says Georget, "is attached to disorders in the functions of the brain, unless there exists a complete want of reason; although an individual is attacked by inability to sleep, cephalagia, moral, intellectual and muscular debility, and sometimes even experiences very marked changes in his tastes, habits, and character; yet, if he reasons, reads, and has some coherent ideas, it is confidently affirmed, especially if there is no cephalagia, that his brain is sound, and that the functions of this organ are not deranged. Observe the inconsistency! If another individual feels a diminution of appetite, a slight disrelish for food, &c., his gastric obstruction is immediately termed a disease of the stomach."*

I pass over in silence the immense influence, exerted by the brain upon the whole animal economy; for, as Georget very correctly remarks, when this organ is diseased, it sometimes occasions the development of sympathetic phenomena, and very serious diseases, sometimes apparently more so than that of the brain itself.

As hitherto these considerations were familiar to no observer, all those observations must be pronounced incomplete and suspicious; according to which it is pretended, that, in cases when the brain was wounded, the moral and intellectual faculties remained unimpaired. Let us see now, whether the information of physiologists prior to the present time, could enable them to fix the seat of mania, and prevent them from eternally falling into contradictions with themselves and with nature.

* T. ii. p. 204, 6, p. 205.

Further researches upon the seat of mania. New proofs, that the brain is the organ of the moral and intellectual powers.

I have already, in this work, abundantly shown, the uncertainty of the opinions of physiologists upon the functions of the brain. The opinions of physicians, in regard to the immediate seat of mania, are not only quite as divergent, but they are even contradictory. Physicians cite numerous instances, in which the functions of the moral qualities and intellectual faculties were disturbed in the most unequivocal manner, and in which, however, no sensible traces of derangement were found in the brain, whilst the viscera, such as the liver, the stomach, &c., exhibited very marked derangements.

Pinel, speaking of the researches of Greding, says : “Can any connection be established between the physical appearances, manifested after death, and the injuries of the intellectual functions observed during life ?”*

Speaking of complete mania, he thus expresses himself : “It appears, generally, that the primitive seat of this alienation is in the region of the stomach, and that from this, as a centre, the disorder of the understanding propagates itself by a kind of radiation.”†

He quotes Goza, Bordeu and Buffon : he is of the opinion, that the abdominal region participates in these sympathetic relations ; and, to support his opinion, he gives a detailed enumeration of all the symptoms that are observed, previous to the manifestation (or eruption) of the mania.

“A sense of constriction,” says he, “often manifests itself in these parts, (the stomach and intestines;) also a voracious appetite, or a decided disrelish for food, an

* De l' Alienation mentale, préface, p. xx.

† Ibid. p. 142 et 147.

obstinate constipation, and intestinal heat, which causes a desire of cooling drinks ; then succeed agitations, vague disquietudes, panic terrors, a constant sleeplessness ; and soon after the disorder and disturbance of ideas are indicated externally by unusual gestures, singularities in the countenance, and motions of the body, which cannot fail to strike vividly the observant eye. The deranged person sometimes keeps his head elevated, and his eyes fixed upon the heavens ; he speaks in a low voice, or utters cries and vociferations without any known cause ; he alternately walks and stands still with an air of deliberate admiration, or a sort of profound recollection ; some are affected with vain fits of jovial humor, and bursts of immoderate laughter. Sometimes, also, as if nature delighted in contrasts, the symptoms are a gloomy taciturnity, an involuntary effusion of tears, or even concentrated sorrow, and extreme anguish. In some cases, the almost sudden redness of the eyes, an exuberant loquacity, presage the near out-breaking of mania, and the urgent necessity of close confinement. A deranged man, after long intervals of calmness, talked at first with great volubility : he frequently burst out into laughter, then he shed a torrent of tears ; and experience had taught the necessity of immediately confining him, for his fits were excessively violent. Paroxysms of maniacal devotion are often indicated by ecstatic visions during the night ; it is occasionally with enchanting dreams, and a supposed apparition of the beloved object, with the features of seductive beauty, that mania on account of love, furiously breaks out, so that it may assume the character of a delicious reverie, or else exhibit extreme confusion in the ideas, and an entire subversion of reason."* Shortly afterwards, the same author thus expresses himself : "A prejudice most injurious to humanity, and one, perhaps, that is the deplorable cause of the abandoned state, in which the insane are almost

* De l' Alienation mentale, 2d edition, p. 142, 143, et 148.

every where left, is that of regarding their malady as incurable, and referring it to an organic injury of the brain or of some other part of the head. I can affirm, that, in the great number of cases that I have collected upon delirious mania, which became incurable, or terminated in some other fatal disorder, all the results of autopsy, compared with the previous symptoms, prove that this kind of alienation has generally a purely nervous character, and is not the result of any organic unsoundness in the brain. Every thing, on the contrary, relating to these insane persons, indicates a strong nervous excitement, a new development of vital energy; their continual agitation, their occasionally furious cries, their propensity to acts of violence, their obstinate watchfulness, the animated look, their passion for the pleasures of love, their petulance, their lively repartees, an indescribable sense of superiority in their own powers, in their moral faculties. Hence arise a new order of ideas, independent of the senses, new emotions without any real cause, all sorts of illusions and forebodings. We ought not therefore to be surprised, that expectant medicine, that is, moral and physical regimen, should sometimes effect a complete cure." *

He thinks, in short, with Everard Home, Frederic Lobstein, and Fodéré, that the organic injuries, which are often discovered in deranged persons after death, prove nothing, because they are frequently observed after diseases which have nothing in common with mania, such as epilepsy, apoplexy, convulsions, nervous fevers.

I have already answered most of the objections and difficulties, which Pinel finds in these passages. We see, to our great astonishment, that this learned man seeks for the primitive seat of mania in the lower belly, that is, in other words, he places in the abdomen the seat of the intellectual faculties; but this error I have amply refuted.

* *Ibidem*, p. 154 et 155, § 157.

The symptoms which, according to his observations, presage the eruption of mania, have evidently more connection with the brain than with the abdomen. *Agitation, vague disquietudes, a constant state of watchfulness, disorder and disturbance of ideas, reveries of admiration and abstraction, excesses of jovial humor, concentrated sorrow, ecstatic visions during the night, enchanting dreams, the apparition of the beloved object, an entire subversion of the reason,* are surely symptoms which must be imputed to a derangement of the brain.

Pinel lays it down as a principle, that the character of mania is purely nervous, and thinks thus to exclude its seat from the brain; but, when reasoning in this manner, he does not reflect that the brain itself is the greatest and richest of all nervous systems; he forgets the difference, that exists between a derangement of the vital functions, and an organic derangement; a difference of which I have already spoken, and which Boyle has admirably explained.* It is the vital functions of the brain which suffer most in mania, and this is proved by the symptoms alleged by Pinel. *The continual agitation, furious cries, acts of violence, obstinate watchfulness, the animated look, passion for the pleasures of love, petulance, lively repartees, a sense of superiority in their own powers, a new order of ideas independent of impressions made through the senses, &c.,* are not these so many proofs, that the instruments of the moral qualities and intellectual faculties is in a state of inordinate excitement?

I admit that these same organic injuries may be found in other diseases, as are often found in alienation; but, according to Pinel's own observations, that proves absolutely nothing in favor of his assertion.

This able man very judiciously observes, "That

* Dictionnaire des sciences médicales, t. ii. p. 61. Anatomie pathologique.

causes the most diverse may in certain cases produce the same varieties, and that the same cause may occasion very different cases of mania."* Thus, then, in general, the same causes may produce in different individuals diseases absolutely different, and different symptoms in different individuals, affected with the same disease. The same kind of food refreshes one, and affects another with indigestion; the same indigestion causes in one, violent pains of the head; in another, apoplexy; in a third, convulsions, vomiting, diarrhea; in a fourth, frightful dreams, nightmare, delirium, &c. It is the same with external impressions. The same affection, the same impressions, and even the same poison, that occasions in one a violent colic, a total prostration of strength, fainting fits, plunges another into complete mania, and affects a third with a transient irritation only. We need not be astonished, then, if epilepsy, apoplexy, and mania, are sometimes produced by the same cause. "There is no insanity, therefore," says Fodéré, ("or it will be only temporary, or on account of organic imperfection,) without some predisposition;†" and the species of insanity will differ according to the nature of the predisposition. I cannot agree with Pinel, when he affirms, that, in most cases, he has been unable to find any visible trace of disease in the brain of those affected with incurable mania. The autopsies of Morgagni, Greding, Ghisi, Bonnet, Littré, as well as our own numerous researches, contradict Pinel's assertion.‡ If, in future, this learned man will bestow more attention upon the diminution of the cerebral mass, and the changes produced in the cranium, modifications which I shall point out, when I treat of the influence of cerebral diseases on the brain, he will find in the contents of the cranium, much more frequently than he has

* De l' Aliénation mentale, p. 140, § 146.

† Traité du délire, t. ii. p. 120.

‡ Cabanis, du moral et du physique de l' homme, (2 edit.) t. ii. 449 et 450.

heretofore done, sensible traces of mania, at least as secondary consequences of the previous derangements, which the vital functions had experienced.

I am persuaded, indeed, that the cause of numerous mental diseases susceptible of cure, is found in the lower belly; but it is found there so far only, as diseases of the abdominal viscera become remote causes of those diseases; the proximate cause of mania exists, and must exist, in the contents of the cranium. When intestinal worms occasion itching in the nose, sternutations, cough, blindness, epilepsy, mania, who would presume to maintain, on this account, that the seat of the itching, sternutations, cough, blindness, epilepsy, mania, exists in the intestines? Physicians have explained, always, the symptoms which appear in parts remote from the seat of the disorder by sympathy. But are there any parts between which exists a sympathy more marked than that between the brain and the abdomen? *

For this reason, physicians who undertake the treatment of mental diseases, ought never to lose sight of the great influence which the brain exercises over the viscera of the abdomen. Every one knows how much an exertion of the mind too long continued, enfeebles the digestive powers; that grief often gives rise to diseases of the liver, &c. In like manner, it is frequently very difficult to determine, whether disorders existing in the abdomen, have reacted upon the brain and disturbed its functions, or whether the brain was the first cause of the disorder in the abdominal functions.

It is certain, that the observations of Pinel prove nothing against the doctrine of the brain's being the

* M. Dubuisson justly remarks—"In sympathetic mania, all the disorders have the seat in some of the abdominal viscera, or in the organs of generation; whence emanate, as from a focus of irritation, the perturbing influences, which disturb the natural rhythm of the cerebral functions, and determine the subversion of the understanding." Dissertation sur la manie, p. 72.

seat of mania. I address myself now to his pupil, who, like him, is especially engaged in the treatment of the insane.

Esquirol, after many doubts, finishes with the following expression: "Delirium is idiopathic in acute or chronic inflammation of the meninges or of the brain; in effusions acute or chronic, primitive or secondary; in organic injuries of the cranium, the brain, or its membranes. Wounds of the head, inflammation of the meninges, cephalitis, hydrocephalus, apoplexy, mania, dementia, paralysis, idiotism, cretinism, offer numerous examples of idiopathic delirium." *

Afterwards, Esquirol speaks of causes which indeed exist in remote parts, but which nevertheless occasion a sympathetic mania. We find, then, in this author, the same ideas that I have developed above, upon the immediate seat of mania, and upon remote causes which co-operate in a secondary manner.

I shall cite the autopsies of Esquirol, so that the reader may be able to appreciate the advantage to be drawn from such examinations.

Esquirol attended a woman, who, after a series of afflictions, had lost her mind: she died at the expiration of about five months. "On opening the cranium, a very fetid odor from suppuration was exhaled. The dura mater was slightly injected, but sound. There appeared, on the sides of the middle portion of the longitudinal sinus, two oval branches, an inch in length, eight lines in thickness, and elevated two lines at their centre; they were formed by a protrusion of the convolutions in this place, and by some granulations. In the corresponding parts of the particles there were two depressions made in the thickness of the bones, which, in this place, were thin and transparent; that portion of the arachnoid, which covers the dura mater, was sound.

"The portion of the arachnoid investing the cere-

* Dictionnaire des Sciences Médicales, t. viii. p. 253, article *Delire*.

brum, exhibited here and there white patches. On the left side, under this membrane, which retained its transparency, was seen a broad, yellowish patch, formed by pus, effused into the subjacent cellular tissue, in quantity about an ounce.

"The whole tissue of the pia mater was infiltrated with pus; the arachnoid of the lateral and inferior parts of the cerebellum was covered with true purulent coatings, so firm that they could be moved in the form of opaque, yellowish membranes, under which was found the arachnoid itself, of a whitish color and thickened. The pia mater on the inferior surface of the cerebellum exhibited the same infiltration of pus as that of the cerebrum. It was the same with the portions of membrane investing the annular protuberance.

"All the gray substance of the base of the cerebrum was blackish, flabby; the pia mater could not be detached from it, without converting it into a pap almost fluid and very fetid.

"At different points in the convolutions of the base of the cerebrum, the white substance had become bluish and softened. This alteration, which was observed in the peduncles, did not penetrate more than half a line into their interior.

"This disposition was equally remarkable in the two substances of the cerebellum and its peduncles.

"The two lateral ventricles were much distended, and contained each three ounces of turbid, purulent serosity; the middle one contained about two drams; the coats of all these cavities were not smooth, as they are in a natural state; but they were covered with a purulent membrane, of a yellowish white color, which gave them a rough aspect. In some places, laminæ could be taken off from this false membrane; but almost every where the attempt reduced the whole to a pulp.

"The optic thalami were of a deeper color, and less consistence than in their natural state.

"The corpora striata, above all, exhibited a very re-

markable alteration ; they had lost their general form, but they were interspersed with depressions and protuberances, which gave them the appearance of an old fungous ulcer ; their substance was diffluent under the finger, and in a true state of putridity ; the viscera of the chest were sound. The mucous membrane of the intestines exhibited, at different points, fungous prominences, but no ulcerations."

The subject of the second observation is a female, aged thirty years. At the age of twenty-five, suppression of the menses took place from fright, on account of a fire ; the next day delirium supervened, and afterwards mania and stupor alternately.

" Cranium thick, ivory like, contracted in front, and especially on the left side ; dura mater strongly adherent to the cranium ; purulent effusion throughout the whole duplicature of the two laminæ of the pia mater, penetrating the sinuosities of the convolutions, and even into the ventricles.

" The gray substance of the cerebrum was discolored, soft, and in some cases almost fluid. The white substance appeared in the same state, particularly in the lateral ventricles." *

In the *Dictionnaire des Sciences Médicales*, article *Démence*, Esquirol recapitulates the phenomena observed in his autopsies.† " The cranium," says he, " is often thick, sometimes of an ivory appearance, sometimes diploic, very frequently injected ; it is more rarely thin, but then sometimes injected ; its thickness varies in different regions. The dura mater is often adherent,

* Ibid. p. 12, 13 et 14. " What, above all, renders these facts very remarkable," say the compilers, " is that, notwithstanding the great alteration of the brain, its membranes and all their dependencies, no external symptom afforded any suspicion of the nature of the malady, during the life of the patients."

If these gentlemen would endeavor to investigate the doctrine, which they think it their duty to oppose on all occasions, they would be found less frequently fighting against wind-mills.

† *Dictionnaire des Sciences Médicales*, t. viii. p. 290—292.

either to the vault, or the base of the cranium, sometimes thick ; frequently its vessels are developed, injected. The internal surface of the dura mater is lined with a membraniform thalamus, as if the fibrine of the effused blood had extended itself in the form of a membrane over this surface ; almost always serous and albuminous effusions are found between the arachnoid and the pia mater, which cover and almost efface the convolutions. Effusions at the base of the cerebrum are common : they almost always occur in the ventricles of the cerebrum."

The autopsies of Esquirol reveal organic defects in the brain of deranged persons, much more frequently than Pinel supposes ; and it is because our discoveries have rendered the former attentive to many circumstances that had escaped the latter. Esquirol, however, would remain faithful to the principles of his master ; but, at every step, the evidence of facts compels him to admit, that the brain is the organ of the intellectual faculties, and, consequently, in opposition to Pinel's opinion, that mania and dementia have their seat in the brain, and by no means in the abdomen. Nevertheless, this distinguished man, some years ago, perhaps through excusable timidity, manifested a singular disposition to deny the functions of the brain ; a disposition which certainly can alone explain the contradictions into which he fell at that time, in his various articles upon delirium, insanity, mental alienation, &c.

Finally, if Esquirol did not believe the brain to be the seat of the moral qualities and intellectual faculties, and, therefore, of mania and dementia, why should he measure and draw the heads and craniums of the insane ? Why should he expect, by those means, to arrive at important results, relative to the theory and treatment of the different kinds of alienation ?

It is very desirable that Esquirol should collect, into one general view, what he says under the article *Folie*, upon the causes, generally moral, of alienation, and upon the symptoms which are its precursors ; upon the

transition from one species of insanity to another, and upon the kind of death peculiar to the insane. With what truth he expresses himself upon the predisposing causes of insanity !

"I am more than ever convinced," says he, "that the existing causes of insanity do not act abruptly, except when the patients are strongly predisposed. Almost all the insane exhibited, before their disease, some alterations in their functions; alterations which commenced many years previously, and even in their early infancy; the greater part had had convulsions, cephalagias, colics or cramps, constipation, menstrual irregularities; several had been endowed with great activity in the mental faculties, and had been the sport of vehement, impetuous, and angry passions. Others had been fantastical in their ideas, their affections, and passions; some had had an extravagant imagination, and been incapable of continuous study; others, excessively obstinate, could not live, except in a very narrow circle of ideas and affections; whilst many, void of moral energy, had been timid, fearful, irresolute, indifferent to every thing. With these dispositions, a mere accidental cause is sufficient to make the insanity break out."*

It is therefore proved, by the very observations of Pinel and Esquirol, that the brain must be recognized as the seat of mental diseases.

It is a very lamentable thing, when writing for men, who should have the clearest ideas upon mental disorders, to be obliged first to fix the true seat of mania. Fodéré also falls from one contradiction into another, while opposing the doctrine of the cerebral functions.

He undertakes to prove, at the same time, that the brain is neither the seat of the propensities, instincts, and faculties, nor the immediate seat of mania, which he calls *delirium*.

"It must be perceived," says he, "that animals, espec-

* Dictionnaire des sciences médicales, t. xvi. p. 195.

ially the mammiferous, notwithstanding the extent of their brain and its construction, almost in every point analogous to that of the human brain, have a very slightly developed sensibility; that they want ideas and imagination; that they possess very few moral affections; that their passions are limited to physical necessities, and entirely subordinate to the bodily powers; that, in short, they are exempt from that disease known under the name of *insanity*. Therefore, the most intelligent men of all ages have concluded, that, even if the brain is an organ which ministers to intelligence, if it concurs in the phenomenon of insanity, its maladies (for that of brutes is equally susceptible of them,) are not sufficient to produce it; they have been confirmed in this conclusion by the absence or extreme minuteness of brain in several animals, whose instincts are considerably acute; and hence they have said, that the brain is not even the exclusive seat of instinct." And he adds in a note—"What proves more effectually than every thing else, that the intellectual energy is far from being proportionate to the cerebral mass, is the observation which every one can make, that the volume of the head predominates in the early stages of life, although this is the precise time, when our understanding is characterized by the greatest weakness. The researches of anatomy demonstrate, that the cerebral mass, which at birth constitutes a sixth part of the body, afterwards relatively decreases, so that in the adult it forms only a thirty-fifth part: it is not, therefore, by its mass that the brain can contribute to intellectual life."*

I shall prove, in this volume, that the proportion which the brain bears to the whole body, is a deceitful means for estimating the degree of intelligence; besides, it is very natural, that, with equal volume, a brain which has not yet attained its maturity, should not as yet exercise its functions in their full vigor. And, indeed, how

* *Traité du délire*, t. ii. p. 82.

can we expect sound views from writers, who, like Fodéré, have the most erroneous ideas of comparative anatomy? Let one compare a calf's brain, pl. iii. that of a sheep, pl. xiv, that of the orang-outang, pl. xxiv, that of a lion, pl. xxxiii, fig. 4, with the brain of a man, in order to satisfy himself whether these brains have the same extent, and a structure, in almost all respects, analogous to that of the human brain.

Fodéré, in support of the assertion, that the brain is not the seat of mania, says, p. 134—"In considering the seat or proximate cause of insanity and predispositions, we have stricken from the list injuries and organic defects, because these aggregated solids are in contrast with the mobility of the seat of many diseases."

Fodéré confounds the products of the first cause of mental alienation, the organic injuries, with injuries of the vital functions. There are maladies which, like the gout, may have their seat in any part of the body possessed of sensibility: a similar malady may affect to-day the head, to-morrow the foot; but as the brain is exclusively the seat of the intellectual faculties, that alone can be the seat of their derangement. Fodéré thus continues: "The phenomena of nutrition, of secretions, leave no room to doubt, that we are constantly renewing some part of our body; John Bernoulli, having calculated the amount of this renovation, found, that, by a continual change of matter, a man loses two-thirds of his body in the space of a year; that, at the expiration of two years, there does not remain more than a fifteenth part of the original matter, and that a man who lives eighty years, has his substance renewed twenty-four times during the lapse of that period. However exaggerated this estimate may be regarded, it is impossible, from the daily instances of the astonishing power of the absorbent system, to deny that it is fundamentally correct; but if the sensible part of our bodies are incessantly changing, whilst the habits, temperaments, and predisposition to diseases remain the same throughout life, we must conclude, that there exists a primordial

type, to which these propensities and dispositions are attached, and which changes much less than the other parts of the body."

True, there does exist a primordial type, and according to this type the body is organized during the whole of its existence. If one did not exist, the human body, in the course of eighty years, would have assumed twenty-four entirely different forms, and the same individual would have become twenty-four different times a stranger to his own eyes. Yet Fodéré himself grants that the propensities and faculties change with age, in proportion as the organization becomes improved or deteriorated. Let us see now what this author substitutes for the organ of the faculties, the qualities, and *delirium*: he admits a *vital principle*, and "it is particularly in the blood," according to him, "that this principle of life chiefly resides." How is it possible to conceive, according to this hypothesis, that the propensities and qualities remain always the same? Does the blood change less than the other parts of the body?

Fodéré, in spite of his assertions in opposition to my doctrine, is obliged to return to my ideas. "This principle," says he,* "is, like the other fluids, subject to the laws of statics, and its equilibrium maintains life and health; its accumulation in certain organs augments their activity, and frequently at the expense of those that are the least favored by it. The organs are its ministers; each of them, under its impulse, fulfils the function assigned to it;" and in another place,† he adds—"The impulse given to the vital principle, communicates itself immediately to the organs through which it exists, and without which it cannot subsist." What can be said more favorable to organology in general, and to the doctrine which places the seat of the soul in the brain in particular?

Indeed, our author thinks his theory so well ground-

* Page 139.

† Page 85.

ed, that he undertakes to draw from the observations of Mr. Home, several corollaries, of which I shall cite the following :

1st. "That, since compression of the brain, by breaking in the cranium or otherwise, disturbs the exercise of the intellectual faculties ; and the removal of the compression restores this exercise, the brain is really a viscus which is connected as an instrument with the state of reason or insanity." *

3d. "The intervention of the brain in the animal functions, is also proved by the pathological state which is very frequent in the brain of insane persons, and more frequent than in any other disease ; but it is quite evident, that, setting aside the accidents occasioned by wounds, fractures, contusions, concussions, which immediately produce an interruption in the exercise of all the functions, and which form a particular exception, the brain is not primitively injured when the first symptoms of insanity appear ; but the injuries observed after death, are created during the disease. We have instances in which the brains of maniacs, who committed suicide before the disease had produced those organic alterations, that would occasion a natural death, are found in a perfect state of integrity ; whence we must conclude, that in researches of this kind, the brain should be considered only as a secondary organ." †

Here again Fodéré takes no account of the vital functions, the derangement of which always precedes the organic injuries.

5th. "That a state of automatic dementia, and idiocy, is almost always accompanied by marks of flaccidity or relaxation of the encephalic organ, either partially or throughout its whole extent ; which pretty plainly indicates, that a cohesion or some tenacity, or what is understood by energy, is necessary, both to the perfect exercise of the intellectual faculties, and to the generation of mania." ‡

* Page 111.

† Page 112 et 113.

‡ Page 113.

Fodéré even asserts, that, "as the temperate climates exhibit the greatest development of the intellectual faculties, and the highest degree of moral energy, so they are also the most fertile in maniacal and melancholic affections."

A new proof that mania must have the same seat as sound intelligence.

To all these avowals of our adversaries, I add the following observations :

"The internal organization of the cerebral pulp," says Cabanis, "is still in a great degree unknown ; it does not appear that the instruments, which we at present possess, can afford us any new discoveries. We have, I think, nothing more to expect from the use of the microscope, or the art of injection. If we wish to investigate farther the human anatomy in general, and that of the nervous system in particular, we must have recourse to other methods, other instruments. The organic conditions, also, without which this system performs its functions imperfectly, or not at all, are at least very difficult to determine ; but the observation of diseases and autopsies, have furnished some useful considerations, which are also intimately connected with the usual phenomena of sensibility. I proceed to bring together these results.

"In the natural state of the brain, it is easily seen, that its color, consistency, the capacity of the vessels which inclose it, or which are immersed between its divisions, have been determined and regulated by nature.

"It cannot be doubted, that there exists a direct relation between these circumstances, and the manner in which the functions of sensibility are performed ; for a change in the one, is attended by a proportionate modification in the other. When the pulp is more or less consistent, more or less colored, than it should be ; when its vessels are in a collapsed or excessively dilated state ; when their continued fluids have too great consistency or tenuity, are inert or acrimonious ; the sensitive functions no longer are performed according to their estab-

lished order. Sometimes the brain is found in a peculiar state of softness : it is drenched with serosity or lymphatic and gelatinous matter ; its color is tarnished and slightly yellowish ; its vessels, almost collapsed, show in their main trunks scarcely any vestiges of blood, and that, pale and impoverished ; sometimes the cerebral mass, on the contrary, has a firmer consistency than in its natural state ; its pulp has a dry appearance, and is almost friable to the touch ; frequently its vessels are then injected with brisk vermillion blood, sometimes with that which is thick, blackish, and viscid. Sometimes also the eye perceives traces of real inflammation, that is, not only are the arteries and veins brightly delineated, the former with purple, and the latter with blue, tinged by an unusual reddish cast, but the white membranes and the pulp itself are specked in different points with a bloody shade.

"Finally, as we have already remarked, (t. i. p. 188,) it may happen that the pulp may be of unequal consistency, firm and dry, in one part, soft and humid in another, and foreign bodies of different kinds be pretty frequently formed in it, as ossifications, calculi, cartilage, schirri, &c. All the causes inherent in the nervous system, upon which delirium and insanity often depend, are comprehended under two general heads : 1st, the peculiar maladies of this system ; 2d, the vitiated states, which it is susceptible of assuming.

"In a paper, dictated by the true genius of medicine, Pinel says, he has several times observed in idiots a remarkable depression of the vault of the cranium : there are few practitioners who have not had an opportunity to observe the same thing ; but Pinel referred it to geometric principles, and, according to these, determined the forms best suited to the action and free development of the cerebral organ, and those which obstruct its enlargement and disturb its functions. I have also, several times, seen imbecility produced by this cause. I have thought, in other cases, that I could refer it to the extreme smallness of the head, to its almost perfectly

spherical form, especially to the flattening of the occipital bone and the posterior parts of the parietals.

"These defects of conformation, although, in their location, and generally as respects their cause, foreign to the brain itself, nevertheless influence its habitual state in a manner so directly organic, that they may be reckoned among its peculiar diseases. I place in the same class, ossifications or petrifactions of the meninges, (particularly those of the dura mater,) their schirrous degenerations and violent inflammation. All these diseases may cause great disorder in the intellectual operations, and it is generally by occasioning convulsive fits, accompanied by delirium, that they disturb the action of the sensitive system.

"Anatomic dissections have shown in a considerable number of subjects, who died in a state of dementia, various changes in the color, consistency, and all the sensible appearances of the brain. Pinel affirms, that he has discovered nothing of the kind in the bodies that he has dissected; and we may confidently rely upon the assertions of an observer, so sagaciously and so scrupulously accurate; but it is impossible to reject those of many skilful anatomists, who are not less worthy of credit. Besides the malformations of the skull, and the alterations of the meninges, of which we have been speaking, Ghisi, Bonnet, Littré, Morgagni, and several others, have observed in the remains of the insane, different, and much deeper degenerations of the very substance of the brain. There have been found schirri, masses of calcareous phosphate, several species of true calcule, osseous concretions, effusions of corrosive humors; the vessels of the ventricles have been seen, sometimes distended with brisk and vermillion blood, sometimes stuffed with blackish, viscid, and deleterious matter; and as, in a more moderate degree, these organic disorders have, many times, been accompanied by correspondent and proportional disorders of the mental faculties, when they are found in maniacal and furious insanity, it is difficult not to attribute it to them.

"But the most remarkable observation is that of Morgagni, who, in his numerous dissections of the brains of the insane, almost always saw augmentation, diminution, or more frequently inequality of consistency in the brain; so that the pulp was not always too hard, or too soft; but generally the softness of certain parts was in opposition to the firmness of others; which seems to explain directly the want of harmony in the functions, by that of the tonic powers peculiar to the different parts of their immediate organ.

"Such, in general, are the organic dispositions of the brain, proofs and examples of which have been furnished by medical anatomy. But the comparison of many dissected subjects, have enabled us to refer these phenomena to the sensitive dispositions, which correspond to them during life."^{*}

Since my arrival at Paris, the brain has become an object of particular attention. Autopsies have been multiplied, and they have fully confirmed my own observations.

Georget, enumerating the causes that have prevented physicians from finding the seat of mental alienation, charges even autopsies with "having had that effect. "On the one side," says he, "the delicate and imperfectly known organization of the brain, hardly allows us to appreciate all the changes that can occur; on the other, in diseases of this organ, which, without being of themselves fatal, may endure for a great number of years, it is impossible, judging merely by an examination after death, to avoid confounding the cause of these diseases with the cause of death, and to avoid taking the latter for the former, the cause of death being generally much more evident than that of the cerebral affection. There is another consideration, which has always struck me, because it appeared to me highly important: it is, that we are seldom enabled to see a brain perfectly sound, since

* T. ii. p. 447.

few patients die without having been affected by fever and delirium, phenomena which depend upon irritation of this organ. A truly pathological state of the brain must therefore most generally be taken for a sound one ; and I have almost always observed, upon brains supposed to be sound, both internally and externally, a multitude of colored shades in the gray substance, from pale rose bordering upon the yellow, to a very deep rose. I have observed the same in cases of alienation. Sometimes this coloration is general ; sometimes it exists in certain convolutions only ; and sometimes it varies in the different regions occupied by the gray substance."*

As inflammation of the brain is the most common cause of derangement in its functions, I think it will be useful for me to bestow a few remarks upon that subject.

"The inflammatory state of the brain," says Georget, "is far from being known in all its organic gradations of color, and yet this state must very often occur; to this must necessarily be referred all those cerebral disorders, functional or otherwise, which are characterized by a general or local excitement. The autopsies of recent times, particularly those published by Rostan and Lallemand, have already produced very satisfactory results. I will acknowledge, that it is especially since I have read the reflections of the professor of Montpellier, on the organic characters of the first degree of cerebral inflammation, I have observed a variety of tints in the two substances of the brain, particularly in cases of alienation. A Mrs. Dieudonné died last winter at la Salpêtrière, exhausted by an attack of acute mania, which had existed four months. The white substance of the brain was injected, of a violet color ; the gray, throughout its whole extent, was of the finest rose. Dr. Mitivié opened the body of M. B***, who had died after an attack of mania ; the brain exhibited precisely the same tints.

* Physiologie du système nerveux, t. ii. p. 205.

In many other cases less remarkable, we have had occasion to repeat the same observations. I am convinced that, in the course of a few years, the pathological anatomy of the brain will make great advances, and that few bodies of insane persons will be examined, without exhibiting appreciable traces of the affection of this organ."*

Lallemand says, that he has, within a few years, observed a greater number of cerebral affections, than any author who has written upon the subject. I soon perceived, says he, that they were much more common than is generally supposed, and much more imperfectly known than those of any other organ. He frequently found circumscribed congestions, efforts at hemorrhage, with or without effusion of blood, inflammation of the brain with mollification and vascular injection, infiltration or effusion of blood, mollification with infiltration of pus or incipient suppuration; abscesses; chronic affections, for example—encysted abscesses, scrofulous tubercles, fibrous, osseous, schirrous, cancerous tumors, hydatids, foreign bodies; affections of the arachnoid, for example—circumscribed congestion, sanguine, sanguinolent, or serous exhalation, acute inflammations of different degrees, turbid, lactescent or gelatinous serosity, suppuration; chronic inflammation, as, thickening of the arachnoid, increase of its consistency, diminution of its transparency, development of granulation at its surface, acute hydrocephalus, chronic hydrocephalus, &c. †

Another work, in many respects highly valuable, but relative to the treatment of arachnitis, very bad, makes us acquainted with the frequency and nature of inflammation of the cerebral envelopes, especially of the cerebral and spinal arachnoids. ‡

* L. c. p. 219.

† Recherches anatomico-pathologiques sur l'encéphale et ses dépendances. 1820. A Paris, p. i. et xvii, &c.

‡ Recherches sur l'inflammation de l'arachnoide cérébrale et spinale, par, M. M. L. Martinet et Parent—Duchâtel. Paris, 1821.

Lallemand has made some excellent reflections upon the treatment of inflammation of the brain and its membranes. But his excellent advice was rarely followed in the observations, reported with great accuracy in this work.

Inflammations the most decided, and recognized as such, were, from their commencement, treated with emetics, blisters, frictions of camphor, the most irritating antispasmodics, the most exciting lotions, and all promiscuously, leeches, venesection, blisters, camphor, nitre, sinapisms, sulphuric lemonade, quinquina, ether, arnica, valerian, &c. What pernicious examples for students and readers are the modes of treatment mentioned on pages 190, 234, 237, 245, 252, 257, 260, 279, 299, 312, 320, 341, 345, 353, 356, 364, 367, 386, 440, 464, 513, 522, 524, 543, 560, 572, 577, 583, 588! Throughout nothing appears but inconsequence, regardless of principle, and the most revolting contradiction in the choice of means! Is it astonishing, then, that the reporters should have been obliged to acknowledge, that success in this disease is very rare in the hospitals, and that the disease is almost inevitably fatal, when it is highly acute, when its progress is very rapid, and that delirium and the comatose state appear at the very commencement? Broussais and Lallemand succeed infinitely better by the use of frequent and copious venesecti ons, cooling beverages; in short, by a method purely enfeebling, soothing, anti-phlogistic, without any contradictory mixture, as I was taught, in all kinds of inflammation, by my immortal professor Stoll!

When I was engaged, at Vienna, in my researches upon brains, nearly all of those which were brought to me from the insane hospital and almshouses, especially those of persons, who died of supposed nervous fevers, malignant, dynamic fevers, of the typhus, showed evident signs of inflammation. I imparted this general observation to Peter Frank, and several physicians, who had become Brownists. They replied, that these apparent inflammations were nothing but passive congestions.

In vain I told them, that I not only found the meninges and the cerebral substance injected, gorged with blood; but also serous exudations coagulable lymph, adhesions, granulations, *pus-like* and *purulent* matter, very frequently suppurated points, and that, consequently, I saw genuine active inflammation. But, from that time, I taught in my lectures at Vienna, in my travels, and at Paris, that the typhus, the nervous, malignant, adynamic fevers, were, in most cases, nothing but real inflammations of the brain; and that in the mental alienation there generally existed an inflammation, at first acute, but which afterwards became chronic. I have also, in that way, shown why the crania of the greater part of insane persons, either became thickened, or more frequently of an ivory hardness.

In the hospital at Munich, we saw a very robust young man, who had just entered. He had drunk too large a quantity of bock, a very heady kind of beer; he had a frightful pain in his head, and soon lost his reason; his delirium continued, his face became very red, his eyes excessively bloodshotten, &c. Spurzheim, and myself, pronounced the disease to be a very acute inflammation of the brain. This was denied, on account of the extreme prostration and convulsions of the patient, and the exciting treatment was continued. He died the next day, and we found both the brain and the meninges in the most intense state of inflammation.

A short time after my arrival at Paris, I was called, on a consultation, to a young man, twenty-one years old, of a vigorous constitution, &c. : he had been excessively heated on horseback by a very hot sun. An intense headache obliged him to return home. Remedies were applied, which the physicians and the women call calming, (*tranquillizing sedative*;) the headache increased to such a degree, that he soon became frantic, with a total prostration and universal rigidity. There you might have seen five doctors, zealous to pour down the patient's throat, wine, tinctures, ether, to rub him with camphor, and every thing else high-

ly volatile and spirituous, to administer irritating lotions, &c. I declared, contrary to the opinion of my five brethren, that I had never seen an inflammation of the brain more decided, more strongly characterized than this. They would not listen to me. At my departure, I requested these gentlemen to be so kind, as to invite me the next day to the examination of the body. The patient died towards night, the body was opened, but they were careful not to invite me. In this case, the total prostration of strength and the convulsive state were alleged against me. But these are the precise circumstances, which most decidedly characterize a very acute inflammation of the brain and its envelopes. In fact, how can the powers subsist, when they are attacked at their very source? and how can the nervous system and its dependencies remain calm, when the brain is so violently irritated?

I was suddenly taken with a violent pain in my head; as it frequently happened after I had eaten any indigestible food, for instance, the minutest portion of mutton. At first I was not inclined to use any remedy. But the pain became insupportable; all the veins of the head and face were swollen; I felt an extreme heat; at the same time my thighs and legs were twitching with convulsions. I then caused myself to be copiously bled. Scarcely had this been done, when the convulsions ceased, the pain in my head diminished, and in a few hours it had wholly disappeared. It would be difficult to estimate the evil which erroneous notions, relative to different kinds of debility and the word *calmans*, (tranquillizing,) continue to produce every day!

After this digression, I must now continue to dissipate doubts and refute objections.

Continuation of the doubts and objections against the theory, according to which, the brain is the organ of the intellectual faculties and moral qualities.

Cases, in which one hemisphere, or the entire brain, has been annihilated, as it is pretended, without directly affecting the exercise of the intellectual and moral faculties.

Some think they have seen an entire hemisphere of the brain destroyed by suppuration, without having occasioned any derangement in the exercise of the intellectual faculties. Ought it not to be expected, that, in such a case, the exercise of the functions of at least half the intellectual faculties, would be rendered impossible?

I might say, that observations of this kind are very doubtful; but let us admit them to be absolutely correct, since I myself have observed such a case in the Institution Thérésienne, at Vienna. An ecclesiastic suffered a long time from an erysipelas upon the forehead, which often disappeared, and after a while appeared again. All his left side was so debilitated, that, in order to walk, he was obliged to use a staff; at last he was struck with apoplexy, and died at the expiration of a few hours. Three days previous, he had preached, and, as usual, attended to the instruction of youth. Upon examination, I found half of the right hemisphere converted into grumous substance, of a dirty yellowish white color. At the time of this autopsy, I had not discovered the true structure of the brain, and, consequently, was incapable of making a perfectly accurate observation. Nevertheless, it is manifest, that the exercise of the intellectual faculties had continued in an astonishing manner, notwithstanding so considerable a deterioration of one hemisphere. How can we conceive of this phenomenon, if it be true that the brain, and its in-

tegrant parts, are exclusively the instruments of the mental faculties?

I have proved, in the first volume of my large work, that the nervous systems of the spinal marrow, of the organs of sense, and of the brain, are double, or, in pairs. But, as, when one of the optic nerves, or one of the eyes, is destroyed, we continue to see with the other eye; so when one of the hemispheres of the brain, or one of the brains, has become incapable of executing its functions, the other hemisphere or the other brain, may continue to perform those belonging to itself; in other words, the functions may be disturbed or suspended on one side, and remain perfect on the other.

Tiedemann relates an instance of a man, named Joseph Moser, who was deranged on one side of his brain, and with the sound side observed his own alienation.

Some physiologists think such a case is a partial alienation, rather than an alienation of one entire side of the brain; but I have good reasons for being of a different opinion. A minister, at Vienna, was attacked during three years with the same disease; he communicated to me an account of it; he described minutely the manner in which each side of the brain was affected. On the left side he continually heard insults uttered against him, so that he always turned his eyes that way, although, with the right side, he distinctly perceived, that these sounds came from no other source than a derangement in the left side of his head. When he had a fever, he was incapable of combating the illusion. For a long time after his recovery, whenever he drank wine to excess, or abandoned himself to anger, he perceived, on the left side of his head, the signs of a relapse.

At Paris, I attended a young lady, who frequently expressed to me her apprehension of falling into dementia on one side of her head, because she observed, that the process of thought was not the same on this side as on the other.

Another lady, a woman of infinite sense, made nearly the same remarks to me; she distinctly felt, she said, that

she perceived every thing differently with her left side from what she did with the right; that every thing affected her differently on different sides. She told me, that sometimes her faculty of thinking was completely shackled on that side, and that this inability was accompanied by an icy torpor : it seems to me, (these are her own words, and she applied her hand perpendicularly upon the middle of her forehead,) it seems to me, that from the front to the back of my head, the brain is divided into two distinct halves. Neither of these ladies had the least knowledge of the cerebral structure, or of my physiological discoveries.*

The following case, which I have already cited elsewhere, is also appropriate here. A physician, with whom I studied in Vienna, frequently complained that he could not think except with one side of his head ; he felt distinctly the inefficiency of the other side. Indeed, the weak side was much less elevated, and much narrower than the other.

Many physicians think it improbable, that the two hemispheres could exist in states so different, and that the exercise of their functions could differ in so striking a manner. But what is hemiplegia, but a paralysis of one half of the brain, which occasions paralysis of one side, and generally the opposite side of the body ? I have seen a patient thus affected, who was confined to his bed more than twenty years ; the diseased side wasted away, the eye on that side became gradually affected with atrophy, whilst the other retained all its vigor ; the mouth was constantly drawn one side ; and yet I did not observe that he had lost any one of his intellectual faculties.

In cases of cerebral effusion, which so often occur in

* Extract of a letter of Dr. Bailey, written from Rome to Dr. Brayer, 30th May, 1822. " You may tell Dr. Gall, that I have a cast of Tasso, which was taken from his face, and that although one part of the organ of poetry is cut off, still the lateral breadth of the cranium in this direction is enormous.

children, after an inflammation of the brain, that has been misconceived or badly treated, one side of the head is almost always hotter than the other, and to this side they keep it inclined. Generally on this side, the blood-vessels are more turgescent, and we find inflammation, and even suppuration, hydatids, in the cerebral membranes, and a more abundant effusion.

In the megrim,* the blood-vessels are manifestly more turgescent on one side than on the other ; we have had an opportunity of verifying this, through the complaisance of Osiander, professor at Göttingen. This eminent man showed us the brain of a young girl, who, after having suffered a long time with the megrim, had died of this disease ; the vessels of the diseased side were much more distended than those of the sound side.

A child died in consequence of a blow received upon the right side of the head ; the middle portion of the right parietal, as well as the portion of skin covered with hair, were bruised. When I had laid the brain bare, I found the whole right hemisphere pale and void of blood, while the left hemisphere was of a bright red, very much injected and inflamed. This proves, to a demonstration, that the two hemispheres may be found in a diametrically opposite state. If the child had lived, it would certainly have been paralyzed on the left side, and would have experienced violent convulsions on the right side.

In the optic thalami of a woman, who had been in a state of dementia several years, we found, on the left side, a large ulcer which had destroyed a part of it ; in consequence of this waste, the corpora striata, and all the left hemisphere, were sunken and diminished by one half. Plate lii.

Since, therefore, the state of one hemisphere of the brain may be wholly different from that of the other,

* Megrism, (hemicrania,) a pain which affects only one side of the head.

this difference must extend to the functions of these hemispheres also ; and since all the organs of the primitive faculties of the mind are double, it is possible that, in the severest diseases and injuries of the brain, all those faculties may exist, whose organs have not been paralyzed or destroyed, at the same time, on both sides.

My doctrine upon the functions of the brain would be more than compromised, if what Bérard and Montégre assert in the following passage were even possible. "In short," say they, "experiments, but especially pathological facts, show, that all the parts of the brain can be successively destroyed, and yet the functions of animal life, at least for some time, remain entire; which proves, that all the parts of the nervous system can, to a certain extent, mutually supply each other." *

This is not only demolishing, at a single blow, the whole of my physiology of the brain, but also destroying the possibility of any kind of cerebral physiology.

It is apparently, from the experiments of Zinn, Arne-mann, Le Gallois, &c., that Bérard and De Montégre deduce so fruitful a corollary. I have already shown how we should judge of such violent mutilations, the authors of which confound phenomena, arising from irritability, with those of sensibility; besides, in these experiments, not a word is said about any moral quality, or any intellectual faculty; and who indeed would be so infatuated, as to expect the least manifestation of an innate aptitude or propensity, from an animal whose brain had been mutilated or entirely extracted?

I promise Bérard and Montégre, that I will renounce all those discoveries so vexatious to them, the very moment they give me evidence of a single experiment, in which all the *functions of animal life*, and, consequently, all the intellectual faculties and moral qualities, exist even for a moment, either in an animal, or in a man, *all*

* Dictionnaire des Sciences Médicales, t. vii. p. 318, art. Cranioscopie.

the parts of whose brain have been gradually destroyed.

And, as to pathological facts—will these gentlemen tell me of monsters born without brains? I wish to know the intellectual faculties and moral qualities of these monsters!

Will they cite the magical effects produced by magnetism? In this case, I will refer them to the section upon the difference of the nerves; * there I have showed, that each nervous system has its peculiar sphere of action, from which it cannot depart. But I will also renounce those arguments, the moment they show me a somnambulist who sees with his nose and hears with his fingers, a clairvoyant,† who makes a discovery in anatomy or physiology.

Cases, in which no brain has been found, or, rather, in which it is pretended that the brain has been dissolved or disorganized, by water accumulated in the cranium, without causing a cessation in the exercise of the intellectual faculties.

Have heads void of brain ever existed?

Durverney found a cranium entirely without cerebral substance, and filled with nothing but water.‡ Zacutus Lusitanus saw a child without brain, which lived three years, but the meninges were double. Other anatomists recount similar facts; and in our travels, we have met with physiologists who believed that heads could exist without brains. Although we were then unable to point out the precise errors of these observations, the manner in which Morgangi regarded them, would be sufficient to make us suspect them; this accurate and faithful ob-

* T. i. p. 127, édit. in 4to, et p. 91, édit. in folio.

† One who sees through the eyelids, bandages, &c.

‡ Liber i. Observatio iii. In this case, as in that which I myself observed, the child was apparently still-born.

server, as well as Bonnet, Vesalius, Tulpis and others, having discovered the existence of brain, in precisely similar cases, reproaches Duverney upon the subject.

Lauffer indeed rejects the observation of Zacutus Lusitanus, because he knows, that, in the case alleged by that anatomist, the brain had been dilated into a thin membrane ; but he himself speaks of a new-born child, in whose brain he found water, but no cerebral substance. He attempts to prove that a brain had previously existed, but that it had been dissolved by the water. Generally it has been admitted, that in hydrocephalus the brain is dissolved by water ; this dissolution has been designated by the particular name of *colliquatio* or *dissolutio cerebri* ; hence Boerhave thought that, by a moderate fire, the brain might be converted into a subtle vapor. Haller and Sœmmering speak of these erroneous observations, without denying them.

Even those who regard the brain as the organ of the mind, think that in hydrocephalus it is dissolved, and to this circumstance they impute the inefficiency of the senses and intellectual faculties, or the complete imbecility which appears to them a necessary condition of this disease. Walter of Berlin expressly says,—“In cases of internal hydrocephalus, the medullary substance is softened by the acridity of the water, and becomes liquified ; but it is urged towards the periphery, so that when examining such a brain, we make an opening in the cortical substance, which, on account of the pressure it has experienced, is not more than a line in thickness, the water flows out, bringing with it a greater or less quantity of the liquified cerebral substance.” “This enables me to comprehend,” continues this anatomist, “why persons affected with hydrocephalus, can eat, sleep, keep awake, respire, and why all their secretions and excretions can go on, whilst their intellectual faculties are lost. It cannot be otherwise ; for when the workshop

of the soul is demolished, she can no longer act upon the body." *

Ackermann maintains, that, in this case, the cerebral mass, on account of its softness, is evidently distended by the water, and that there is undoubtedly a destruction of its organic form. Boyer thinks, also, "that, in hydrocephalus, the gray and white substances are confounded."

Many physiologists were well aware, that the medullary substance sometimes became dilated like a bladder by effusion of water into its cavities; but they could form no idea of the nature of this dilatation; they could not conceive it possible, that a substance purely medullary, or, even medullary fibres so delicate and soft, could be uniformly distended throughout the whole mass, without rupturing those parts, which, being dilated first, would be found the thinnest.

Admitting the reality of all this destruction, they conceived it impossible for the intellectual faculties to exist. Tulpius, however, had seen a person affected with hydrocephalus, who retained all his intellectual faculties. Upon examination of the body, he and all the assistants were astonished to find, that, with such a state of the brain, the exercise of the faculties should have been continued; from that time he thought, that the structure of the brain must be very different from that taught in the schools. Vesalius and Camper report similar cases, and with the same astonishment.

Indeed, if in hydrocephalus, the brain is dissolved or disorganized in any manner whatever; if this waste is a necessary consequence of its structure; it must either be denied that there are any cases, in which, with any considerable degree of hydrocephalus, the faculties have been retained; or it must be acknowledged, that the brain is not necessary to the exercise of the mental fac-

* Etwas über Doctor Gall's Schoedellehre.

ulties ; that it is not the organ of the intellectual functions.

Whilst I was in this state of uncertainty, a woman, whose head was so large, that I thought it must contain at least four pounds of water, called for my assistance. This woman, in spite of her hydrocephalus, appeared to have intellectual faculties, in no respect inferior to those generally possessed by women in her station. After her death, which occurred in her fifty-fifth year, I found, in fact, more than four pounds of water in the cerebral cavities. Plate xxv represents this brain in its natural dimensions ; I have removed the superior part of the unfolded brain, so that the inferior half of the two cerebral cavities is visible. N, N, N, N, N, N, is the contour of these cavities, the whole surface of which is of the color natural to the white fibrous substance. The convolutions were not completely unfolded, except in the superior part of the brain. We perceive, however, that the convolutions situated towards the front, are already considerably unfolded and flattened ; 25, 25, p. p., are the so called optic thalami ; l, l, l, l, the corpora striata ; there no where exists in it, therefore, either rent, solution, or mixture of the two substances.

During our travels, we became acquainted with a distinguished naturalist, whose head, to judge by the extraordinary extent of the anterior-superior part of the front, must also contain about four pounds of water. He manifests no weakness of the mental faculties, except that he frequently falls asleep in the midst of amusements, at table, at the theatre, &c. His son, afflicted with the same disease, has a remarkable talent for music.

At Copenhagen, I had occasion to present to my auditors a girl, thirteen years of age, who was affected with hydrocephalus ; her head measured (Vienna measure) twenty-five inches in circumference, eighteen from ear to ear, and the same from the origin of the nose to the nape of the neck ; her feet were almost paralyzed, so that it was necessary to carry her ; still, she was

quite amiable, and improved well at school ; this person has, at least, from ten to thirteen pounds of water in her head.

At Augsburg, I also exhibited to my audience a girl, twelve years of age, whose head had the same form and dimensions as that of the woman at Vienna : this girl, like the woman, was very small ; she talked with much intelligence and spirit.

Laumeyer and Nueffer, professors at Friburg, in the grand duchy of Baden, have in their possession the skeleton of a girl, aged nine years. The cranium contained seventy ounces of water ; this girl retained for several days what she had heard read, and talked in a very agreeable manner.

We saw, at Bruchsal, a girl, fourteen years old, who already menstruated, whose head was enormous, and must have contained twelve or thirteen pounds of water ; she was paralyzed to such a degree, that she could not quit her bed, and her intellectual development had not advanced in proportion to her age ; yet she spoke very rationally upon subjects which interested her.

Tobias, of Leipzig, showed us the cranium of a man who had had the hydrocephalus : he had lived to the age of thirty-five ; at the age of thirty-four, having indulged in a fit of violent anger, he lost his reason.

At Marburg, a girl was shown to us, who, we should think, by the size of her head, must have at least three pounds of water in her brain : she was not observed to manifest any weakness in the intellectual faculties.

Doctor Maler, of Carlsruhe, gave us an account of a patient affected with hydrocephalus, who had attained the age of twenty years ; his head contained more than ten pounds of water, and he had enjoyed all his faculties.

Dr. Spurzheim wrote to me from London, relative to a very remarkable case of hydrocephalus,* pl. lv. fig. 5.

* He caused an engraving of it to be made in his Physiognomical system, p. v. fig. 2.

"It is a young man, nineteen years of age : the circumference of his head is thirty-three inches ; from ear to ear it measures twenty-four inches and a half, and twenty-three inches and a half from the base of the nose to the middle of the nape. This young man enjoys all his intellectual faculties ; he reads English very well ; his chirography is beautiful ; he readily comprehends what is said to him, and has religious ideas ; his language indicates good sense and an amiable character. At every sudden movement, he feels a sensation which he compares to the fluctuation of warm water. He never has any evacuations from the bowels, except by the aid of art ; he sleeps very little, and the least noise awakes him ; his cranium is entirely ossified."

Dr. Spurzheim saw another very remarkable case of hydrocephalus ; the subject was a girl twelve years old. From the nape of her neck hangs a membranous sac, filled with water, and communicating with hydrocephalus. This girl hears and understands very well all that is said to her, but cannot speak. This observer has already met, in England, with five cases of hydrocephalus, the subjects of which enjoy their intellectual faculties.

We see, then, cases of dropsy in the brain, or considerable, and in some instances, extraordinary, hydrocephalus, which have not prevented the manifestation of the intellectual faculties. In all these cases, there existed, as is supposed, in consequence of known physiological laws, and, as I myself formerly believed, a solution, a twitching, a laceration, a compression, a crushing of the brain : in spite of all this, the manifestation of the faculties still continued : can I yet maintain that the brain is the organ of the mind ?

The solution of these difficulties will not embarrass such of my readers as have perused, in my large work, the section upon the structure of the cerebral cavities and convolutions, and upon the natural and artificial unfolding of them. They will recollect that the medullary fibres of the brain are prolonged perpendicularly

above the cerebral cavities ; that, uniformly, two layers of these fibres form a convolution, so that a convolution is nothing but two agglutinated nervous layers, each of which is prolonged perpendicularly from the external periphery of the cerebral cavities, which are covered with a layer of gray substance, about a line in thickness. If, therefore, a considerable quantity of water acts in the cerebral cavities, it will gradually separate the two perpendicular laminae of each convolution, so that at last these will be unfolded to their summit, pl. lv. fig. 1. In this manner they become flattened out, in proportion as the water penetrates them, and when the unfolding is at its maximum, they form one and the same membrane.*

What I have said, will enable us to conceive how the brain, which, above the cerebral cavities, forms thick medullary masses, can be distended into a membranous sac, whose walls are hardly a line in thickness. It is precisely this membranous appearance of the brain, thus unfolded, which caused *Zacutus Lusitanus*, and others to see nothing but a double vascular membrane ; and other anatomists, also, equally inattentive, to see merely a thick vascular membrane, without any trace of a brain.

As, in such a case, there is merely a pressure exerted by the water, and a moderate distension, but by no means a destruction of the cerebral fibres ; as the functions of those fibres, which have passed from a vertical to a horizontal direction, do not, in the least, depend upon their situation, we conceive it possible for the exercise of the intellectual faculties to be continued in cases of hydrocephalus.†

* See the particulars of this subject, in our answer to the report of the first class of the Institute, and t. i. of our great work of Anatomy of the Brain.

† Sir Everard Home attributes the destruction of the cerebral functions, in hydrocephalus, to absorption of the cerebral substance. The subject of the observation which he cites, was a child that died at the

When these heads are opened, limpid water flows from them ; but if, after death, such brains have been transported hither and thither, and much agitated, or if

age of six years, and whose brain weighed only from two to three ounces, whilst the brain of a child, six or seven years old, in a healthy state, weighs two pounds and twelve ounces.

The observation of Sir E. Home would prove favorable to his opinion, if the brains of all children of the same age had equal weight. But the brains of children, as well as those of adults, differ both in weight and volume.

Sir E. Home, after having proved, as he thinks, that, in hydrocephalus, the cerebral mass is dissolved by water, ends his reflections thus :—

"The preceding facts demonstrate, in a satisfactory manner, that the brain is formed of thin convolutions of cortical and medullary substance, enveloping the two lateral ventricles; that these convolutions expand in proportion as the cavities of the ventricles augment, and in this state of expansion, the functions dependent upon this portion of the organ, can retain their perfect action."

Does Sir E. Home mean to appropriate to himself the discovery of the unfolding of the cerebral hemispheres? Several years before I undertook my travels, which were commenced in 1805, in my lectures, at Vienna, before numerous auditors of all nations, I demonstrated the unfolding of the brain. In 1805, we demonstrated in the most celebrated universities of Germany, in Denmark, Holland, Switzerland, &c., and finally, in 1807, in Paris. Would not Sir E. Home have been informed of it? My discovery created too great a sensation, to admit of the supposition that he was not. Our memoir before the Institute, and the report of that society upon it, were made in 1808; our answer to that report, in 1809: this answer was sent to the Royal Society of London, the same year. In 1810, the first volume of our large work, on the Anatomy of the Brain, was sold even in London; and in that volume it is expressly said, as it is in our memoir presented to the Institute, and in our answer, that it was the observation of hydrocephalic cases which led me to the discovery of this unfolding. Finally, in the presence of the London Medical and Surgical Society, Dr. Spurzheim demonstrated the structure and expansion of the brain, previous to the time when Sir E. Home read his memoir to the Royal Society.

Sir E. Home, then, could not be ignorant of my discovery: what motive has he, then, to claim it? *

M. Scämmering, to deprive me of the honor of my discovery, pretends that it is a very ancient one. In a memoir, entitled, *Academicae*

* It has been recently stated, that Sir Everard Home was in the habit of publishing the discoveries of others as his own. It is said that, having access to the manuscripts of Mr. Hunter, he transcribed many of them, and gained much of his reputation as their author. If this charge be true—and we could wish for the honor of man, that it were not—it is difficult even to conjecture, without a particular examination, the extent of his thefts from the literary and scientific labors of others.—Ed.

indeed the subject had been several days dead in the womb, as was the case of the individual examined by Lauffer, it is not astonishing that the water should be turbid; and, from this circumstance, the anatomists may be induced to believe, that a solution of the cerebral mass has taken place.

Therefore, all that was said relative to cerebral dropsy, to heads without brain, brains destroyed, disorganized, dissolved, falls to the ground, and, consequently, all the inductions drawn from these pretended facts, and tend-

Annotationes de cerebri administrationibus anatomicis vasorumque ejus habitu, printed in the Memoirs of the Academy of Munich, volume of 1808, he expresses himself thus: "Non novam autem esse opinionem istam de cerebri plicata fabrica, Jacobi Berengari Carpensis verba sat superque probant." Anfractus cerebri inquit (Commentaria super anatomia, Mondini Bononiæ, 1521, p. 431;) Quos Avicenna commissuras vocat, sunt certe *plicae* seu *plicature*, vel *crispitudines*, quæ sunt in parte exteriori substantiæ cerebri, sicut sunt plicaturæ et crispitudines in vestibus sericeis, laneis et lineis, non totaliter extensis, sed circumvolutis nostris corporibus, quando non sunt totaliter extense, et ideo faciunt illas plicaturas. Quarum aliquæ sunt parvae aliquæ mediocres, aliquæ magnæ, et simili modo sunt in cerebro plicaturæ, quas plicaturas sequitur pia mater ad intra eas. Hæc verba adeo luculentæ videntur, ut nullo commentario ageant."

"This opinion of the folded structure of the brain is not new, and this is evidently proved by the expressions which James Berengari de Capri uses:—“The infraeustosities of the brain,” says he, “which Avicenna calls commissures, are indeed folds or corrugations, which exist in the external surface of the brain, and they resemble the folds and crispations, which silk, linen or woollen stuffs contract, when they are not drawn closely round the body, but when we are loosely robed with them, so that they form folds, some small, some of moderate dimensions, others ample; in the same manner there exist in the brain, folds, which the vascular membrane accompanies in their sinuosities. These expressions, I think, are so clear that they need no explanation.”

Berengari merely describes the convolutions and anfractuosities of the brain, as they appear to the eye; he compares them to folds formed by stuffs, as others have compared them to intestines and called them intestiniform; in the rest of the work there is not a single word which would lead us to presume, that he had any idea of the unfolding of the brain, as I have demonstrated it. Surely, if he had made such a discovery, he would have expressed himself in terms so clear, that anatomists would have had no occasion to read my works and see my anatomical demonstrations, in order to discover traces of the unfolding of the brain in the above passage of Berengari. When a well-attested discovery can no longer be denied, nothing remains but to question its real author.

ing to prove that the brain is not the organ of the mind, are annihilated.*

On brains supposed to be ossified or petrified, notwithstanding which, as is pretended, the faculties continued perfectly to manifest their energy.

Ossified and petrified brains are reckoned among the most appropriate phenomena, to array against the doctrine of the brains being the organ of the mind. Such ossifications were shown me, at Vienna, Leipzig, Amsterdam, Cologne, Paris, and always for the purpose of opposing my doctrine.

My opponents every where mention the ossified brain of an ox, which Duverney presented to the Academy of Sciences at Paris,† and maintain with Dumas, that as, by the testimony of Duverney, the ox had retained all his faculties, the case completely refutes the physiology of the brain.

Lastly, much has been said of a similar ossification, which Giro and Moschetti, provided with written attestation, were very anxious to pass for an ossified brain; and these gentlemen expressed their regret that this fact should overthrow my doctrine upon the functions of the brain.‡

Albert also saw a brain converted into an ivory-like substance,§ which had been given by a butcher to the celebrated Deyeux. Dr. Albert warrants this osseous mass to be a truly ossified brain. Every thing relating to the ossification of the brain has been carefully collected, and considered of great importance, for the very reason, that the world is in a complete error in relation to the whole subject.

* I propose to consider the subject of *cerebral effusions* more thoroughly in a separate work.

† Acta acad. Regiae scientiar. 1703, p. 314.

‡ Gazette de Santé, No. xxxii. 1809, 11 Novembre.

§ Ibidem, 1811, No. ii. premier janvier, p. 3.

These osseous masses are not so rare as is commonly supposed, neither are they so common as Dr. Marie Saint Ursin endeavors to prove. Relative to the petrified brain, spoken of by Giro, Moschetti and Ultini, he cites the thesis of Jægerschmid; but, except a single case which the author mentions incidentally, and upon the authority of Duverney, no instance of a supposed petrified brain is alluded to in this thesis. De Horn, Botall, Mogling, and Scheid, quoted by Jægerschmid, speak merely of small bones which are often found in the meninges, and Marie Saint Ursin cites these little bones as so many examples of petrified brains!

The pretended case, in which the cortical substance was ossified, and in which, within this ossification, all the rest of the brain was found in a natural state, never existed; indeed, an instance has never been presented, which could deceive the most superficial observer.

All the petrified brains, which some pretend to have seen, were and are nothing but osseous tumors upon the internal surface of the cranium, that gradually thrust back the brain, without destroying it. Sometimes these excrescences are formed upon one surface only of the cranium, sometimes upon the external only, and sometimes upon both; in this case, they project externally as far as they penetrate within. This is the case with the cranium, which Peter Frank presented to the university of Goettingen. A similar cranium is presented at the Medical School of Paris. Its external, as well as its internal excrescence, represents a horn, from two to three inches long, and one inch in thickness.

This single circumstance would be sufficient to exclude every supposition, tending to prove that these osseous masses are really ossified brains; some exhibit a spongy mass, considerably friable; the greater part are hard like ivory, but never calculous.* When they

* We sometimes find, in the cavity of the cranium, concretions, independent both of the cranium and the brain, which, from their appearance, may be called calculous; but it would be more accurate to call them osseous, since they are always formed of phosphate of lime.

are very large, and there are none larger than a common brain; the cavity of the cranium is unusually capacious; their surface is unequal like stalactites, and these asperities are what physicians and anatomists, who, I think, never saw a brain stripped of its meninges, have taken for convolutions.

We never can discover, either upon the exterior, or in the interior of these excrescences, the form of any part of the brain. It was, by this fact, that we convinced Professor Bonn, of Amsterdam, that the osseous mass, which he preserved so carefully, was not an ossified brain. From the same circumstance, Haller and Scemmering have always been of the opinion which we profess. The external layer is of a dirty yellowish brown, the interior is of an ivory-like appearance, whitish, and of a fibrous structure.

Giro and Moschetti cut off their supposed ossified brain at the height of the great commissure; they found the color of the interior substance different from that of the exterior; but they could discover neither any cavity, optic thalami, corpora striata, corpora quadrigemina, nor origin of the nerves; and yet they maintain, that the ox, to which this brain belonged, had manifested no sign of disease! Doctor Simson speaks of another pretended petrified brain; he allows that the cerebrum is more voluminous than that of a common ox, that the cerebellum is at least six times as large as in its natural state; that even its form is absolutely different from that of the ordinary brain, &c.; finally, he adds, that it had been attached at one end to the cranium, and violently separated from it; and yet, after all these avowals, he considers this osseous mass as an ossified brain, and merely because a butcher found it in the cranium of an ox!

Twenty years ago, Valisneri advanced every thing that can be alleged, to prove that these osseous masses are not petrified brains. He begins by proving, that there can be no question in regard to the petrified brains, whose existence a Benedictine friar attempted to establish. He then shows, that the brains supposed to be ossi-

fied, are mere excrescences of the cranium; he proceeds to say, that one of these excrescences in his possession resembles the brain of an ox much more than that of Duverney; but that the prominences and depressions which it exhibits, can by no means be compared to convolutions; that in the interior, nothing can be perceived similar to the plexus choroides, or any other part of the brain of an ox.

Other bodies, he observes, when they become ossified, retain their primitive form. Duverney and the Academy of Sciences made a great mistake, by relying upon the testimony of a butcher; if Duverney himself had opened the cranium, he would have found, besides the osseous excrescences, the brain of the ox. A butcher of Modena is said to have been more observant, and actually to have found the brain by the side of the excrescence. Valisneri has given engravings of similar ones; every body, at first sight, would take his pl. ix. for the representation of an ossified brain. It exhibits a furrow in the middle, and two lateral parts covered with prominences; but, upon closer inspection, it is perceived that these prominences have no resemblance to the convolutions of a natural cerebrum, and that there is no part of the excrescence which can be compared to the cerebellum. As Duverney, in his osseous mass, showed the pineal gland, Valisneri made an engraving of this same mass. In the first place, the supposed pineal gland would be enormous; moreover, this gland being situated within the brain, and Duverney's ossified brain having never been cut, it would evidently be impossible to see the pineal gland, even if it were present. The portions, which Duverney maintains to be the cerebellum and the *processus vermiciformis*, have not the least resemblance to those parts; Duverney even thought that he found the *processus vermiciformis*, and the pineal gland, in a region opposite to that in which nature has placed them; and the Academy made no objection to all this!

Duverney thought that these osseous excrescences were exceedingly rare, and that no known specimen

existed, except that in his own possession. Valisneri, to controvert this opinion, mentions five, and gives drawings of them all ; he also took the pains to give a true representation of the brain of an ox, along with that of the pretended ossified brain of Duverney, in order to make the difference perfectly manifest.

We can conceive the reason, why Giro, Moschetti, and Ultini imagined that they had found the centrum ovale. If these osseous excrescences be sawed in any direction whatever, the internal surfaces will be found of an ivory white, that is, nearly of the same color as the brain exhibits, when cut in that part which Vieussens calls the centrum ovale.

As to the state of health of the subjects that have osseous excrescences in the head, it is true that men, as well as animals, can live for years with such excrescences, and enjoy the exercise of various functions ; yet in all the known cases, symptoms have been observed which result from great pressure upon the brain. In all those cited by Valisneri, not only were the animals meagre, but all their functions had become enfeebled.

If this extraordinary pressure can be endured so long a time, it must be attributed, apparently, to the slow formation of these excrescences.*

Ossified brains, therefore, owe their existence to the ignorance and love of the marvellous, manifested by observers, who pretend to have discovered them ; and the objections to the doctrine, that the brain is the organ of the mind, founded upon these ossifications, do not deserve the least attention.

* M. Fodéré proposes the truly original opinion, that the soundness of the faculties of an ox, which has an ossification in the brain, proves the great pre-eminence of the nervous system of man over that of brutes.

SECTION II.

**ON THE MEANS OF FINDING, BY THE AID OF THE CEREBRAL STATE,
A MEASURE FOR THE INTELLECTUAL FACULTIES, AND THE MORAL
QUALITIES.**

NOTWITHSTANDING the discrepancy of opinion upon the design of the brain, there have been found some philosophic physicians and physiologists, of sufficient sagacity, to maintain, that the brain is not only the instrument of all the intellectual faculties, but also of all the moral qualities; in general, the organ of the whole human character. These physicians and physiologists, such as Buchard, Boerhave, Van Swieten, Channet, Haller, Mayer, Sœmmering, Cuvier, &c., made the brain the particular object of their meditations and researches; they were convinced, that determinate relations must exist between the brain and the propensities and faculties; they attempted to discover the laws of these relations; and, to obtain their object, they neglected no resource which science in their times could afford them.

If we reflect upon the innumerable difficulties which they must have encountered, we readily excuse them for failing in their attempts; and, indeed, we must acknowledge, that we have been but a short time in a condition completely to embrace this subject. Let us not forget, that every species of animals is provided with a brain appropriate and peculiar to itself, relative to the appropriate and particular qualities of each species; let us remember that thousands of species of animals are yet wholly unknown to us; that the species which we know, as to name and external form, have not been studied, either in regard to the integrant parts of their brain or their peculiar qualities. What do we know of

domestic animals ? The advantage which we derive from them. What knowledge have we of wild animals, other than that which enhances the pleasure of the chase ? What do we know of insects, reptiles, amphibious animals, birds, of the infinitely diversified species of the inhabitants of the sea ?

This cheerless prospect is surely of a discouraging nature to the most intrepid physiologist. At each step, his goal recedes : but, when he reflects upon the grandeur of the object which he is pursuing, his courage revives ; it is the history of the brain that he proposes to trace ; it is the history of the animal, of the living man, that he is to write ; his purpose is to fathom all the depths of thought and all the caprices of the will ; to unveil the springs of all the propensities, inclinations, mechanical aptitudes, in short, of all the faculties ; his ardor is rekindled, his heart is warmed ; he feels that he has received a sacred mission to accomplish so sublime a task ; and if an inward sentiment of insufficiency warns him that he will produce only a sketch, he says to himself, "I shall have furnished some materials for a magnificent edifice."

I proceed to give an account of the attempts which have been hitherto made, to determine the relations existing between the brain and the functions of the intellectual faculties ; I shall estimate the value of these attempts, and finally show, what we may expect from the most recent discoveries.

*The absolute volume of the brain, compared with its functions.**

If it be admitted, that the brain is the organ of the mind, the conclusion, that its functions must have a di-

* If, in this discussion, the *mass* of the brain is sometimes spoken of and sometimes the *volume*, it is because, among the authors whom I cite, some have attended to the mass, others to the volume ; but as our observations are applicable in both cases, this difference is of no importance.

rect relation with this volume, is perfectly natural. A much larger cerebral mass has been found in man than in the largest of our domestic animals, for example, the ox, and horse ; and, without more accurate researches in the animal kingdom, the predominant qualities of man were attributed to his greater cerebral mass ; the world maintained generally, with Aristotle, Erasistratus, Pliny, and Galen, that, of all animals, man had the most considerable mass of brain ; an opinion which has also been embraced by some moderns.

At a later period, it was found that the cerebral mass of the elephant, (pl. xxxv.) and several of the cetaceous order, was more considerable than that of man. This circumstance would naturally embarrass the partisans of the opinion to which we have just referred. In vain shall we extol the faculties of the elephant, and constitute the whale, king over the marine inhabitants ; we shall scarcely be authorized to attribute to them those qualities, which form the pride of man. It became necessary, therefore, to renounce the opinion, that the intellectual faculties were to be estimated by the absolute mass of the brain.

The dog and the ape have a less cerebral mass than the horse, the ox, or the ass, and yet, in regard to intelligence, the former greatly surpass the latter. The wolf, sheep, swine, and tiger, are nearly in the same predicament, relative to the cerebral mass ; and yet they are endued with qualities the most different, and even the most opposite. The fly-catcher and pigeon have nearly equal masses of brain, but there is a great difference in their instincts.

We see, moreover, that, by means of an extremely small cerebral mass, nature can produce the most wonderful effects ; instances of this are the ant, and the bee : who has not observed their domestic economy, local memory, mechanical activity, their anger, the revenge which they inflict in a body, their careful education of the young, the harmony which reigns in a hive, or ant-hill ? What is better adapted to its purpose than the spider's web, or the shaft of the formica-leo ? Do we not see in the

staphalinus the blood-thirsty image of the panther? that of the jealous, proud, intrepid stag, in the valiant cock? those of the belligerent mōse and wild boar, in the warrior,* and red-breast? Who will venture to say, that nature is deficient in the brain of the minutest insect, and that she has exhausted her resources in the brain of the whale?

If the mass only of the brain were to be considered, if its integrant parts were not to be regarded as elements in the calculation, the only difference between animals possessing a large cerebral mass, and those having a small brain, would be a greater or less intensity in the exercise of the intellectual faculties. The qualities peculiar to each species cannot be explained by the mere mass of the brain. The individuals of one species live solitary, those of another form societies; in some, the males and females live in a state of marriage; in others, no lasting union exists between the sexes. One kind of animal takes the greatest care of its offspring; another abandons them; some animals build habitations; others migrate; others sing, &c. Can all these different instincts be explained by the magnitude of the cerebral mass? It is idle then, to seek, in the absolute mass of the brain, for a scale by which to measure the instincts, propensities and faculties.

The proportion between the volume of the brain, and that of the body.

Physiologists have manifested some reluctance in abandoning the idea, that the volume of the brain furnishes a scale for the measure of instincts, inclinations and faculties; they could not deny that the elephant and whale have a more considerable mass of brain than man; but, said they, the cerebral mass must be com-

* A kind of woodcock, called the warrior. (*Fringa pugnax*, Linn.)
16*

pared with that of the entire body; and it is very evident that the mass of the elephant's or whale's body, divided by that of its brain, gives a greater quotient, than the mass of man's body divided by his cerebral mass. Moreover, they added, the spinal marrow and other nerves, both of which should be considered as continuations of the brain, constitute in these animals a much larger mass than in man; hence, a great part of the cerebral mass of these animals, is destined to the use of the organs of sense, to that of the voluntary motions, in a word, to the functions appertaining to nervous systems of a secondary order. In man, on the contrary, whose nerves are generally much smaller, it is quite the reverse. According to calculation, a much smaller cerebral mass, in the elephant and whale, is appropriated to the superior functions than in man. Hence, it follows, that the elephant and whale have, in proportion to the mass of the body, a much smaller brain than man.

Many phenomena strengthen these opinions, both with respect to the proportion of the cerebral mass to that of the whole body, and with respect to the proportions of the absolute mass of the brain. Reptiles, amphibious animals, and fish, have extremely small brains, both in regard to absolute mass, and in comparison to the entire mass of the body. The brain of a crocodile twelve feet in length, of a serpent eighteen feet long, or of a turtle weighing from three to eight hundred pounds, weighs, at most, two or three drams. The brain of the great vulture is not more voluminous than that of the crow. The turkey-cock has a less cerebral mass than the gray parrot; facts which favor the opinion, that it is the proportion of the cerebral mass to that of the whole body, which furnishes a scale, by which the instincts and faculties are to be estimated.

But the facts, above mentioned, are subject to many exceptions. Wrisberg, Sœmmering, Blumenbach, Cuvier and others, found that the sparrow, green canary, robin, wren, and especially several kinds of monkeys, have, in proportion to the body, a much larger brain

than man. These animals, then, in regard to intellectual faculties, ought to surpass man, and be infinitely superior to the stag, dog, and elephant. Several small species, also, in which nearly the same proportion exists, between the mass of the brain and that of the whole body, should likewise have nearly the same instincts, and the same faculties, and in equal degrees of perfection; but this is in direct opposition to experience.

Besides, it is almost impossible to determine the proportion between the mass of the brain and that of the body. Cuvier and others have attempted it; but their attempts are far from producing perfectly satisfactory results. The brain of an adult, according to Cuvier,* is to the body in the ratio of one to thirty-five. But, in fact, it is much more frequently as one to forty, fifty, and even sixty; for, suppose an adult to weigh from a hundred and twenty to a hundred and fifty pounds, and his brain from two and a half to three pounds, the proportion is that which I have stated above.

Cuvier, therefore, in comparing the cerebral masses of man and other animals, sets out from false data. Furthermore, he does not tell at what point he separated the brain from the parts adherent to it, whether, when he weighed it, there were larger or smaller portions of the nerves and medulla oblongata attached to it; whether he had stripped off the meninges or not; whether the meninges, if remaining, were filled with blood, or whether they were free from it; what was the age of the subject, whose brains he weighed.†

Haller had already remarked, that, in infancy, the brain is larger in proportion to the body, than in adult age. If, then, when investigating the measure of the

* *Anatomie comparée*, T. iii. p. 149.

† There is, also, another source of inaccuracy. Individuals, possessed of very superior faculties, have, other things being equal, larger brains than those of ordinary talents. If, then, you compare the weight of a man's brain, endued with extraordinary qualities and talents with the weight of his body, you will find a very different proportion from that, which would result from the same experiment made upon a fool.

intellectual faculties, we were to consider the proportion only which the brain bears to the body, the infant should have more intelligence than the man or woman.

Sœmmering and Cuvier find, also, another difficulty in determining the ratio between the weight of the brain and that of the body. The weight of the body, say they, may be increased or diminished by one half, by a change of the individual, from a fleshy state to that of leanness or the reverse, but the brain does not participate in this change.

It is true, that the brain is not susceptible of growing fat, that is, as little adipose matter is deposited in the cerebral, as in the pulmonary substance; but it is certain that the contents of the cranium participate, with all the other integrant parts of the body, in the effects which result from very abundant or insufficient nourishment. Both in men and other animals, of a mean age and well fed, the brain is heavy, the convolutions are turgescent and compacted against each other. In decrepit, emaciated subjects, on the contrary, the brain, with equal dimensions of body, is sometimes not more than half as heavy as in the former case. The convolutions are flabby, and in some places even sunken. When persons have died of consumption, sometimes upon the whole internal surface of the cranium is found the impress of the convolutions; because, in consequence of the emaciation of the convolutions themselves, they leave wider intervals between them, and because the meninges become thin. I have made, with respect to this, most accurate observations upon rabbits, cats, monkeys, birds, and human subjects.

The proportion between the brain and the nerves.

Wrisberg and Sœmmering were therefore correct in the conclusion, that they must look elsewhere, than in the direct proportion between the cerebral mass and that of the body, for a scale to determine the inclina-

tions and faculties. These physiologists have observed, that, in other animals, the nerves bear a much greater proportion to the brain than in man. Hence they concluded, that, of all animals, man has the largest brain, not absolutely, nor relative to the body, but in comparison to the nerves. They, therefore, regard the proportion between the mass of the brain and that of the nerves, as the measure of the intellectual faculties. Afterwards, Cuvier adopted the same opinion.

This point of view is more generally correct than the other. In some insects a single nerve contains a much greater mass than the entire brain ; in fishes, reptiles, amphibious animals, the mass of the nerves is immense compared to that of the brain ; even in the most noble mammiferous classes, the spinal marrow, or at least several of the nerves of sense, compared with the brain, are much larger than in man. Yet this proposition is not generally true. If the monkey, the little sea dog, or birds, be compared with man in this respect, the result will be in their favor. If animals have some nerves larger, as for example, the optic nerve of birds ; others, for example, the olfactory, are as much smaller. The porpoise has a larger brain, compared with its nerves, than the orang-outang ; the phoca, a greater cerebral mass than the dog. The brain of a young unweaned porpoise was found a third larger than that of an adult human subject, although, with the exclusion of the optic nerve, which is entirely wanting, or according to Cuvier, extremely small, its nerves are not much more considerable than those of man.

The proportion between the nerves and the brain, therefore, cannot serve as a rule for the instincts and faculties. Besides, this comparison is founded upon the erroneous opinion, that the brain is the point to which all the nerves converge ; that all the nerves proceed from the brain ; that they are all a mere prolongation of it, ramifying into all parts of the body ; and, consequently, that nature appropriates to the nervous functions, a

smaller part of the cerebral mass, according to the diminutive volume of the nerves.

Scemmering found, perhaps, in some female subjects, smaller nerves than he had usually found in males ; he, consequently, maintains that women have larger brains than men, in comparison with their nerves ; and that by this means nature makes a recompense for the inferior magnitude of their brain, in reference to that of man. In our dissections we have paid particular attention to this circumstance ; but, as, in the same individual the optic nerve may be very small, whilst the olfactory nerve is quite large, and *vice versa*, as in general the relative proportion of the nerves admits of great variation ; so, a large brain may coexist with very small nerves, and a small brain, with nerves of very considerable magnitude. A person of very weak organs of sense, and a delicate constitution, may have as much intellect and even genius, as if he had the eyes of a lynx, a very acute ear, &c. and the body of an athlete.

The proportion between the brain and spinal marrow.

Messrs. Cuvier, Scemmering and Ebel, consider the relative proportion of the brain and spinal marrow, as the most infallible measure of the intellectual faculties ; because, say they, this proportion shows how far the organ of thought prevails over the external senses. But Cuvier himself admits that there are exceptions to this rule, and adduces the dolphin as an instance ; but, besides the nerves of the spinal marrow, as well as all others, have their particular functions independent of the brain ; and the exercise of the cerebral functions cannot have less intensity, because some other nervous system has a greater intensity in the exercise of its functions. Were it otherwise, it would be decreed, in the name of physiology, that all persons of delicate complexion should have strong heads ; and all robust, well built and muscular men, weak ones.

Finally, if the proportion of the brain to the spinal marrow and nerves, really afforded a direct means of determining the amount of intellect, this determination never could be made upon individuals while living ; for the secret of ascertaining this proportion, otherwise than by autopsies, has not yet been discovered.

It is proved, therefore, that the doctrine of proportion between the organization and the intellectual faculties, can derive no light from this point of view.

The proportion between the brain and the face.

Some physiologists, among whom are Scœmmering, Cuvier,* Richerand,† Burdin,‡ Dumeril,§ measure the brain to ascertain its proportion to the face ; they maintain that, under this point of view, man, of all animals, has the largest brain, and that animals are stupid and ferocious, in proportion to the magnitude of their jaws compared with the brain. This, say they, arises from the circumstance, that the smaller the brain is, compared with the face, the larger are the olfactory and gustatory nerves ; but, they add, smell and taste are the very senses that reign in animals ; for hunger and the sexual passions act upon them with an irresistible impulse, by which they are impelled, with blind fury, to unbounded cruelty. Therefore, the proportion between the brain and the bones of the face, furnishes an accurate measure for the faculties, instincts, and intelligence of animals ; and the study of this proportion is of the very highest importance to the naturalist. Cuvier, in order to ascertain more accurately the magnitude and expansion of the optic and gustatory nerves, makes a vertical section from above downwards, through the

* *Leçons d'anatomie comparée*, t. ii. p. 4.

† *Éléments de physiologie, &c.*, édit. t. ii. p. 119.

‡ *Cours d'études médicales*, t. i. p. 26.

§ *Traité élémentaire d'histoire naturelle*, p. 367.

middle of the cranium and the upper jaw, then compares the height of the cranium with that of the bones of the face.*

The ancients, continues Cuvier, appear to have observed, that a large forehead, in comparison to the face, indicates remarkable intellectual faculties; for this reason, they gave to their heroes, sages, demigods, their Jupiter, very projecting and large foreheads, compared with the face.

This opinion has been generally adopted; but none is further from the truth, for it is not founded upon experience.

It is by no means the large proportion, which the brain bears to the bones of the face; but it is the large head, the reservoir of great cerebral masses placed in the frontal region, that indicates superior intellectual faculties; for, whether such a voluminous brain is accompanied by a large or small face, there will always be, if accessory circumstances are the same, faculties equally eminent.

Who does not know men endued with superior talents, with very large faces, high cheek-bones, and both jaws broad and prominent? Leo X., Montaigne, Leibnitz, Racine, Haller, Mirabeau, Franklin and others, had, at the same time, very large heads and very large faces. Bossuet, Voltaire, Kant, and others, had quite small faces and very large heads. These proportions are as various in women, and Scemmering mistakes, when he asserts that women have, in comparison to the face, larger heads than men. The sloth and phoca have, in proportion to the brain, the facial bones much smaller than the stag, the ox and horse. The bones of the cat's face compared with the brain, are smaller than those of the dog. But will any one maintain that the dog, the horse and the stag, are less intelligent and more ferocious than the cat and the sloth? The ass is less intel-

* *Cuvier, Leçons d'anatomie comparée.*

ligent than the horse, not because he has a smaller brain, compared with his jaws, but because he has, in general, a smaller cerebral mass than the horse. Animals, which swallow their food without chewing it, or which have very weak masticating muscles, such as the ant-eater, bear-rat, phoca, and most kind of birds, have very slender facial bones. The facial bones have therefore a relation to the nature of the food, the mode of mastication, and the olfactory and gustatory nerves ; but they are not proportionate to the faculties, instincts, propensities, either of the animal or the man. Consequently, the scale in question is not at all applicable.

The proportion between the brain and the neck.

Bichat* and Richerand have revived a method of measuring the intellectual faculties, spoken of by Plato ; according to whom, men and other animals that have long necks, possess intellectual faculties inferior to those of others, because the brain being more remote from the heart, must experience a less degree of irritation through the medium of the blood.† !!

Here the authority of Plato proves but one thing ; which is, that men who enjoy a great reputation, ought, above all others, to avoid throwing out ideas at random ; for, however erroneous they may be, they will be repeated for centuries.

The relative proportion of the cerebral parts.

Finally, the relative proportion of the cerebral parts has been examined, to see if this would not furnish a means of determining the nature and degree of the intellectual faculties.

* Sur la vie et la mort.

† Nouveaux éléments, Physiologie, 7th édit. t. ii. p. 134.

Cuvier thinks there is not the least difficulty in comparing the weight of the cerebellum with that of the cerebrum, since neither is subject to the deposition of fat, and, in general, neither is influenced by the variations, which alterations of the health produce in other parts. He makes this proportion in man as 1 to 9; in the saimiri, as 1 to 14; in the ox, as 1 to 9, &c.

Must we conclude that, because the proportion between the cerebellum and cerebrum is the same in man and in the ox, they are possessed of equal faculties?

I confidently affirm, that no two men exist, whose cerebral parts have the same relative proportion; and that, in each individual, the proportion of the cerebellum to the cerebrum, differs from that of others. I have in my possession several craniums, in which the cerebrum was very large, and the cerebellum quite small: I have others, in which the cerebrum was small, while the cerebellum had attained to a high degree of development. Generally, in men, the cerebellum, compared with the cerebrum, is larger than in women; the contrary rarely occurs. From infancy to the age of puberty, the younger the individual, the smaller the cerebellum compared with the cerebrum, except in a few cases, when this part, contrary to the general rule, is prematurely developed. In women, the posterior lobes, in comparison with the cerebrum, are much more voluminous than in men. In the same brain, it frequently happens that isolated convolutions are of considerable magnitude, whilst others are very small. Tupper repeats the assertion of Scemmering and Rudolphi, *that the form and dimensions of the cerebral parts, are the same in one individual as in another.* If this were the case, all heads and all brains should have nearly the same form and dimensions; but even a superficial comparison is sufficient to establish the contrary.

From what has been said, it follows, that we must renounce the idea of any fixed proportion between the different parts of the brain.

But this extends to those parts only, which constitute

respectively an independent whole, and by no means to the integrant parts of the brain. Each of the cerebral parts which, of itself, constitutes an independent whole, has peculiar functions to perform, and must be considered as a real organ. These parts, as I have already said, have not determinate proportions to other parts.

But, it is wholly the reverse with the various apparatus, which make a part of one and the same organ; for instance, the different origins and various accessory apparatus of the optic and olfactory nerves. There are determinate proportions between these integrant parts, and the organ which they constitute, so that the magnitude of one of these integrant parts enables us to judge of the magnitude of the organ. Thus, for example, a certain proportion exists between what is called the pons varolii, and the cerebellum; determinate proportions exist between the corpora pyramidalia, the anterior part of the great fasci-crura, the supposed optic thalami, or great superior source of supply, the corpora striata, and the anterior and lateral parts of the hemispheres; it is evident that from these proportions between the accessory or supplying apparatus, and the integrant parts of an organ, we can draw inferences in regard to the intensity of particular faculties, but that we can infer absolutely nothing in regard to the intensity of the sum total of the faculties. I here merely indicate this inference; I shall resume it hereafter, and rigorously prove it.

The facial line of Camper.

In order to determine the cerebral mass, and, consequently, the intellectual faculties, Camper draws a base line from the roots of the upper incisors, to the external auditory passage; then another straight line, from the upper incisors to the most elevated point of the forehead: according to him, the intellectual faculties of the man or animal, are in direct proportion to the magnitude of the

angle, made by those two lines. Lavater, with this idea for a basis, constructed a scale of perfection from the frog to the Apollo Belvidere. As nature really furnishes many proofs in support of this opinion, it has been generally received, even by anatomists and physiologists ; and, notwithstanding the arguments by which it is victoriously opposed, the learned cannot resolve to abandon it. Cuvier himself furnishes a list of men and animals, in support of this doctrine ; few naturalists oppose it, but almost all give it their support.*

Camper's attempt necessarily failed ; for his manner of drawing the lines and measuring the facial angle, enabled him to take into consideration the anterior parts only of the brain situated near the forehead : he entirely neglects the posterior, lateral and inferior cerebral parts. This method, then, at most, could decide upon those faculties only, whose organs are placed near the forehead.

Cuvier estimates the facial angle of the new-born infant at ninety degrees ; that of the adult, at eighty-five ; that of decrepit old age, at fifty.

From this statement it appears, that, at different ages, changes take place in the form, either of the brain or the cranium ; hereafter I shall prove that such changes really occur.

The forehead of a new-born infant is flattened ; on the contrary, that of a child some months old, and until the age of eight or ten years, especially in the case of boys possessed of superior talents, it is projecting, and forms, notwithstanding the approximation to the age of puberty, a larger facial angle than in the adult ; this angle, therefore, does not diminish in the inverse ratio of the age. In like manner we find decrepit old men, whose facial angle is as great as it was in the vigor of manhood ; for, although in decrepitude the brain is subject to atrophy, there are old men, the exterior contour of whose crania undergoes no change. The angle, as

* This doctrine is revived, *Dictionnaire des Sciences med.* Delpit and Reydellet.

stated by Cuvier, for different ages, were measured upon different individuals ; if it were estimated upon the same persons at different epochs of his life, the result would be entirely different.

In general, the proportion between the forehead and the face, is different in different individuals. No conclusion can be drawn from the proportions, which exist in one person, relative to those of another ; among a hundred individuals of the same sex and age, no two can be found, in whom the same proportion exists between the forehead and the face ; it necessarily follows, then, that no two will have the same facial angle. Physiologists seem to admit, that the proportion between the brain and the bones of the face, is different in different species of animals ; but they appear to think that, in all the individuals of the same species, all the young, all adults, all the old, there exists a constant proportion between the cerebral mass and the face.

The researches of Blumenbach show that three-fourths of the animals known, have nearly the same facial angle ; and yet what a disparity between their instincts and faculties ! What information, then, do we derive from Camper's facial angle ?

Moreover, as Cuvier himself observes, the cerebral mass is by no means placed in all animals, immediately behind or beneath what is called the forehead. In a great many species of animals, on the contrary, the external table of the frontal is at a considerable distance from the internal, and this distance increases with the age of the animal. The brain of the swine is placed an inch lower than the frontal bones seem to indicate ; that of the ox, in some parts three inches ; that of the elephant, from six to thirteen. In other animals, the measurement is generally commenced at the frontal sinus instead of the cerebrum. From these considerations, Cuvier was induced to draw a tangent to the internal instead of the external surface of the cranium. The cerebrum of the wolf and many species of dogs, especially when the individuals are very old, is placed

directly behind the frontal sinuses. In the wolf, especially the large and most ferocious variety, it is depressed as in the hyena; in the dog it is situated higher or lower, according to the species; but, notwithstanding this difference in the situation of the brain, the facial angle, as it is commonly measured, must be the same; from this the inference would be, that the dog, the wolf, and hyena have the same qualities, and each in the same degree. In the greater part of the rodentia, the morse, &c., the brain is so depressed and so placed behind the frontal sinuses, that the facial line cannot be drawn. The facial line of the cetacea, on account of the singular conformation of the head, would lead to results absolutely false.

I know many negroes, who, with very prominent jaws, are quite distinguished for their intellectual faculties; Yet the projection of the jaws renders the facial angle much more acute, than it would be with the usual conformation of Europeans. In order that the same angle should exist in a European, the forehead must be flattened and retreating. But the foreheads of the negroes in question, on the contrary, are very projecting. Who, under these circumstances, would expect to find the same amount of intellect corresponding to the same facial angle?

The facial line cannot be applied to birds, as many naturalists have already observed.

From what has been said, we should expect that naturalists would at length renounce the facial angle of Camper; but the most ignorant are generally the most conceited.

In spite of this complete refutation of Camper's facial line, Delpit extols it in the following terms:

"If ever a relation of this kind presented characters of generality and fixedness, adequate to excite a reasonable confidence in matters belonging to the domain of empiricism, rather than that of science, it is the relation or proportion of magnitude, which Camper first perceived and revealed, by comparing the brain of man

with that of the different species of animals. We here see a successive decrease of intelligence, proportionate to the acuteness of the facial angle and the consequent diminution of the cerebral cavity. This affords a constant and fixed relation. It can be appreciated with a sufficient degree of exactness by the direct light of comparative anatomy, and by observation of the habits and intelligence of the different classes of animals; it can also be verified by the comparison of men very unequally endowed with intellectual faculties, in whom the contraction of the cerebral cavity and the magnitude of the facial angle exhibit the most remarkable diversities. Here the physiognomical sign has, if I may be allowed the expression, a wide extent of acceptation; it rests upon a broad basis, upon a definite division, and one of easy comprehension and verification; for, if there is some discrepancy of opinion, in regard to the number and nomenclature of the faculties of the mind, the sentiments of the soul, the modifications or shades of character which give birth to particular passions, moral dispositions, habits, whether virtuous or vicious; if these classifications are, in a great measure, arbitrary, and the language used somewhat vague; if, in short, the greater part of these nominal faculties are mere abstractions of the mind, purely imaginary existences, and therefore cannot be actually located in any part of the brain; the case is quite different, when we merely seek to establish a general relation between a constant sign manifested in the organization, and the degree of reason, mind, or intellect attributed to different men, or the degrees of sagacity attributed to different species of animals. Here, no one is at a loss, because there is ample latitude for comparing and judging; in the system of Gall, on the contrary, the comparisons rest upon minute points, which are subject to discussion, exceptions, a thousand uncertainties in the signs and various applications." *

* Dictionnaire des Sciences Méd. t. xxxviii. p. 263.

If the reader will review what I have said against Camper's facial line, he will find a refutation of all this reasoning of Delpit; a proof that he defends it merely because it is in vogue. It is this very generality and fixedness, which render it, in almost all cases, inapplicable; this is the inherent defect in the supposed importance of Camper's facial angle. It is implicitly supposed, that no difference but that of degree, exists between the capacities of the different species and individuals of the human race, and the different species and individuals of the animal kingdom. Thus the intelligence of men and other animals would always be proportioned to the magnitude of the facial angle. This being premised, I ask, which, out of two, three, four, &c., has the most intelligence, the dog, ape, beaver, the ant, or the bee? Ants and bees live in an admirable republic, and form astonishing constructions, which they know how to modify according to circumstances. The beaver and penduline build with equally marvellous skill, and with a foresight which seldom errs; the dog and the ape have very little foresight, and are incapable of the most insignificant construction. Which has the greater intelligence, Voltaire or Descartes? Could the former have been a mathematician and the latter a poet? Which has the higher degree of intellect, Mozart or Lessing, who, with all his genius, detested music? In short, which has the most intelligence, my dog who retraces his steps through the most complicated routes, or myself, who am always going astray? Measure now the facial angle of the ant, bee, beaver, penduline, ape, my dog, and of myself, and estimate the result. Acknowledge, then, that your division, so definite, so easy to be apprehended, is absolutely useless, and that you are obliged to advert to divers instincts, propensities, faculties, and their different degrees of energy, to which your facial angle is wholly inapplicable. Your intelligence, instinct, address, are in reality mere abstractions, imaginary existences. Do you consider the propensity to procreation, the love of offspring, the carnivorous in-

stinct, the talent for music, poetry, &c. as imaginary existences? You see, then, that it is more convenient to tread the beaten path, than to verify observations. I pity students who are obliged to learn such errors in the elementary works of their professors, such as the *Nouveaux Elémens de Physiologie* of Richerand. See tom. ii: p. 119.

The occipital line of Daubenton.

Daubenton draws a base line from the inferior edge of the orbits to the inferior edge of the occipital hole; then another straight line through the condyles, which intersects the base transversely. Blumenbach has already observed, that, in all kinds of animals, without exception, these lines form an angle of from eighty to ninety degrees. The occipital line, therefore, does not even indicate the most striking differences between the brains of species the most diverse, and takes account neither of the superior, inferior, nor lateral parts; consequently, it is of no use.

It follows, from these fruitless attempts, that, until the present day, men have been too ignorant of the structure and functions of the brain, to advance any thing positive, either upon the nature of the qualities of animals, or the means of estimating the degree in which they are possessed.

It only remains for me to place the reader in a favorable point of view, for appreciating the advantages which my discoveries afford in both these respects.

Deductions from different forms of the head.

We have no concern with the different forms of the head, except so far as they denote the form of the brain. Those forms of the cranium, which are independent of the forms of the brain, have no signification in cerebral

physiology. Those, on the contrary, which are the results of cerebral influence, must, necessarily, have a precise signification, since they arise from the development either of the entire brain or of some of its integrant parts.

The art of interpreting the forms of the head, supposes, as will be easily conceived, a knowledge of the functions, both of the brain and its several parts: to satisfy, at this time, the curiosity of the reader, would invert the order of arrangement; therefore I shall here merely make a few general observations upon the form and dimensions of the brain and head, relative to mania, dementia and imbecility.

Many adversaries of cerebral physiology have an idea that *Cranioscopists*, as they please to call us, maintain the existence of an organ of mania, dementia, &c., in general, a form of the head, which enables us to foretell the existence of mania. Instead of studying the spirit of my doctrine, they exert themselves to refute the extravagant opinions, which they themselves impute to us.

Does there exist a form of the head from which the existence of mania can be inferred?

"The opinion is pretty general," says Pinel, "that mental alienation is to be attributed to defects in the brain, and especially to defects and disproportions in the cranium. It would doubtless be an important object in science, to show that fine proportions of the head are the exterior sign of distinguished faculties and superior understanding; so that, in the first place, we might take for our type the master-piece of ancient sculpture, the head of the Pythian Apollo; place in the second rank the heads of men most favorably organized for the fine arts and the sciences; then descend, through all the successive degress of disproportion in the head and intellectual capacity, to the man sunk in dementia and idiocy. But observation is far from confirming these specious conjectures; for we sometimes find the most beautiful

forms of the head, accompanying the most limited degree of intelligence, and even perfect mania ; and, on the other hand, strange varieties of conformation co-exist with all the attributes of talent and genius.”*

We can, without doubt, assign forms of the head, which denote intellectual faculties in general very distinguished, as well as those which result from the development of a particular organ, and which, consequently, indicate merely an isolated talent. But it would be a great error to consider, as the ideal of the intellectual faculties, the Apollo Belvidere, which the sculptor intended only as the ideal of the beautiful. Every one is aware, that beauty and mediocrity, as well as ugliness and genius, frequently co-exist in the same person. If Pinel knew upon what degree of development in the integrant parts of the brain, a particular great talent, such as that of the great musician, geometer, mechanician, &c., depended, he would be less astonished at the fantastical varieties of conformation, found in the heads of certain individuals.

Pinel endeavors to prove, that injuries and monstrosities rarely occur in the heads of deranged persons; “for,” says he, “alienation is a very rare phenomena before the age of fifteen ; and seldom takes place until that of twenty, at which time, the bones of the head are completely ossified ; and the causes which, at a later period, produce mania, such as very strong moral affections, religious fanaticism, disappointed love, intense grief, inordinate ambition, cease to have any effect upon the form of the cranium.”†

In treating of the influence of the brain upon the cranium, I shall prove that Pinel’s assertion is erroneous : even if the exterior form of the cranium were invariable, the brain is not so, and, consequently, the internal surface of the cranium must be subject to variations. The

* Sur l’aliénation mentale, 2d. edit. p. 459 et 460.

† Ibid. p. 455—458.

affections and passions spoken of by Pinel, principally affect the brain, and through this medium only can they react upon the rest of the body. This position is so evident, that details would seem to me superfluous.

Pinel cites, also, the observations of Greding, who, among a hundred insane, found three very large heads, two quite small, and a great number of craniums much thickened. Some of these heads, says Greding, were distinguished by a peculiar form of the frontal: this bone was sometimes smaller and narrower than usual, and contracted at the temples; in other instances it was very much rounded or elongated. As Pinel does not believe, (and in this he is correct,) that the cause of alienation depends upon the form of the head, but that this form has a merely accidental coincidence with alienation, he determined to measure these heads in all their dimensions, in order to form a correct idea of their internal capacity; but as the irregularity of the internal surface of the cranium presented too many difficulties, he was obliged to depend upon mechanical means.*

After having measured several heads, both of persons in the enjoyment of their reason, and of the insane, he became convinced, that a more or a less free exercise of the intellectual faculties can co-exist as well with a round head, as with an elongated one; and, consequently, that mania has no connection with either of these fundamental forms of the cranium, but that certain malformations of the head have a connection with certain kinds of alienation, especially with dementia and imbecility.

I have already spoken of Dr. Esquirol's measuring the heads and craniums of the insane.

From fourteen to sixteen years ago, measurements, in all their dimensions, were made at Vienna, of the craniums of persons who had died insane.

I ardently approve of all the means taken to detect the secret of nature, in regard to so important a point

* Sur l'aliénation mentale, 2d edit. p. 463.

as the exercise of the intellectual faculties, and the derangement of this exercise. If the object is not attained, much is already gained, by knowing what course will not conduct to it.

I have, however, always been persuaded, that the most accurate measures of the internal capacity, and even the most precise determinations of the cerebral form, can afford us no instruction in regard to mania, properly so called. Much less would I entertain the idea, that mania or dementia can ever be detected by the form of the cranium.

Mental disorders, so far as they constitute mania or dementia, are simply a derangement in the functions of the brain, in the same manner as other diseases are merely a derangement in the functions of other parts of the body. One can be affected with alienation, whatever be the form of the brain, just as one, with the best constitution, may become sick. Every brain, without regard to its form, is liable to become deranged, enfeebled or paralyzed, as well as any other part of the body, without regard to its conformation: every man, therefore, is liable to have his intellectual faculties deranged, or enfeebled; that is, to become alienated in mind, or fall into dementia.

It would be presumptuous, however, to maintain the non-existence of any exterior sign, indicative of a greater or less disposition to mental diseases. A physician, who has had any degree of experience, can generally perceive to what diseases a particular individual is subject. There are dispositions to mental as well as to other maladies, inasmuch as they are founded in the constitution: every body knows that a contracted, flat, narrow chest, is indicative of consumption; in like manner, exterior signs exist, which enable us to presume not only dispositions to alienation in general, but to a certain kind of alienation or to a particular partial alienation, especially monomania. But no one confounds a disposition to consumption with the disease itself; and to say that we recognize, by certain signs, a disposition to alien-

ation, is not boasting that, by these signs, we can recognize the alienation itself.

Suppose that the cerebral part, by means of which man is susceptible of moral and religious sentiments, is largely developed, the individual will seize with avidity every thing that relates to these ideas and sentiments. Suppose that the activity of this organ is not balanced by a suitable activity of the other faculties; that the individual happens to be violently affected; he will be threatened with alienation. Do you think him menaced with satyriasis? Do you apprehend that he will believe himself a king, an emperor? By no means. Every one would fear that he would become a prey to pious extravagances. But I abstain from entering into the details here, because, from their nature, they cannot be understood by the reader, until he perfectly comprehends my section upon the particular organs.*

I have observed, that persons, who have very large eyes, projecting even with the head, are generally disposed to some kind of alienation; this is not the case, however, except when such eyes indicate cerebral maladies which had occurred in infancy. Want of symmetry in the head is frequently a consequence of rickets, sometimes also of particular cerebral maladies, such as effusion of the cavities of the brain, &c. Hence in an equal number of heads not symmetrical and symmetrical, a larger proportion of the former will be found to have belonged to deranged persons. Haller and Bichat thought, that a want of symmetry in the two halves of the head, was one of the principal causes of mania.

But it must not be forgotten, that frequently the most healthy heads, I mean those whose form has not been in the least influenced by disease, have the two halves unequal. When children have been constantly accustomed to lie upon the same side, the forehead is often more

* See Section on predispositions to insanity.

prominent on that side than on the other, while the occiput is more flattened than on the opposite side. But such deformities have not the least influence upon the exercise of the intellectual faculties; besides, they frequently disappear at a more mature age. I have already spoken of a friend of mine, one side of whose forehead is half an inch lower than the other. Although he often complains that he cannot think on the less elevated side, nothing has yet manifested itself, which indicates the least trace of mania, or dementia. There was considerable inequality between the two halves of Bichat's head, as is shown by the cast taken after his death. Probably he himself was not aware of this deformity: but, who will maintain that Bichat was not a man of genius? Sometimes the want of symmetry in the head is hereditary, without exercising any influence upon the faculties. I know a family at Vienna, in which all the children, as well as the father, have distorted faces and deformed heads, yet they manifest no derangement of the intellectual faculties.

I am acquainted with other persons, still living, the diameter of whose head is much greater, from one temple to the other, than from the frontal to the occipital; nevertheless, their intellectual faculties do not suffer from this deformity. Galen thought that a child born with such a formed head could not live. I have a similar head in my collection; it is so irregular, that its diameter, from ear to ear, is more than an inch greater than that from the frontal to the occipital; pl. xxxi. and pl. xxxii. I have no knowledge that this head belonged to an insane person.

If the heads of the insane exhibit a part of the cranium, whose interior and exterior dimensions are less than those on the opposite side, and even one hemisphere of the brain smaller than the other; it is frequently the consequence of a long cerebral malady previously experienced; by reason of this disease, one of the hemispheres is considerably atrophied, and the cavity of the cranium on that side, contracted; sometimes

the cranium itself is diminished. Having pointed out the indications, which different forms of the head may give relative to mania, I am to determine the connection which a large or small brain, a large or small head, has with the intellectual faculties.

The influence of a large or small brain, of a large or small head upon the manifestation of the moral and intellectual powers.

The philosophers or physiologists, who, in their works, have discussed the question—Has the mass of brain any relation to the faculties of man ; have delivered nothing but vague opinions upon the subject ; and this will always be the case, until fixed principles shall have been established. In support of what I advance, I shall cite the most distinguished authors. Pinel, who is so often put upon the right track by his observing mind, wants the courage to persevere, as soon as the influence of the cerebral organization over the intellectual faculties becomes the subject of inquiry. It is, nevertheless, true, that his excellent observations, in connection with mine, would be sufficient to determine this question, so important both to physiology and pathology. If any thing vague is found in the opinions of Pinel, it arises principally from the fact that, in mental diseases, he does not always pay sufficient regard to the distinction between *mania, dementia, and imbecility*. Mania, dementia, and imbecility are mental diseases ; but neither dementia nor imbecility is mania, nor is mania, dementia.

I have always regarded dementia and imbecility in the sense ultimately fixed by Esquirol.

“Dementia,” says he, “differs essentially from mania, above all, from melancholia. In these last, the faculties of the understanding are affected by excess ; maniacs and the melancholic rave on account of excitement ; their delirium seems to depend upon a state of convul-

sion, or an increase of energy in the nervous and cerebral systems; they are misled by erroneous sensations, false perceptions, an exuberance or fixedness of ideas. He who is affected with dementia, imagines nothing supposes nothing; he has few, or scarcely any ideas; he has no determination; is passive; the brain is in a state of depression. Whilst in mania and melancholy, every thing indicates force, power, and effort; dementia, on the contrary, is characterized by laxness, impotence, and weakness.

"Dementia must not be confounded with imbecility, or idiocy. The imbecile has never had the faculties of the understanding sufficiently energetic, or sufficiently developed, to reason correctly. One who has fallen into dementia, has lost a great part of those faculties."*

Although this sketch is not at all applicable to partial imbecility, it is sufficient to show the difference between complete imbecility and dementia. Mania and dementia, as I have already observed, have no connection with any particular conformation of the head, or with its volume. It is very different with congenital imbecility, or superior genius. In Pinel's *Traité de l'aliénation mentale*, is an engraving, (plates ii. v. and vi.) of an extremely small brain, which must have occasioned complete imbecility. Upon this subject he thus expresses himself: "Still we cannot affirm, that this want of capacity is the sole and exclusive cause of the slight degree of development of the moral faculties."† True, the extreme smallness of the cranium, and the manifest want of cerebral development, are not the only reason that the intellectual faculties are so circumscribed; for, we meet with those born imbecile, the exterior conformation of whose heads by no means indicates their mental condition; yet, where this want of development exists, there is always imbecility more or less complete.

* Dictionnaire des Sciences médicales, art. *Démence*, T. viii. p. 283.

† Page 474.

If Pinel, as we have seen above, asserts, "that there are certain malformations of the cranium, which are connected with a state of alienation, especially dementia, or congenital idiocy ;" this is true of idiocy only.

Finally ; Pinel compares the two very small heads of persons born imbecile, which he has figured, (plates i. ii. fig. 5 and 6,) with other heads of the insane, and with the head of a very talented child, seven years old. He is especially careful to evince the difference which exists, both in regard to form and volume, between the head of the imbecile and that of the child endued with superior talents.

He points out the thickness of the skull of a girl, eighteen years old, born imbecile, and the contraction of the cerebral cavity, which is a natural consequence of that thickness. He is astonished at the disproportion of this extremely small head, compared with the whole stature and the magnitude of the face.

Pinel, after having painted from nature, and in the most vivid colors, the highest degree of imbecility ; after having evinced, in a precise manner, the singular diminutiveness of the heads of these imbeciles ; in a word, after having discovered the truth, is yet too faint-hearted to embrace it. "But," says he, "I must beware of too precipitate inductions ; I therefore confine myself to historical details, without pronouncing yet that there exists an immediate and necessary connection between the state of idiocy and the malformations which I have described."

And yet he contradicts himself, when, speaking of the small brain, pl. i. fig. 5 and 6, he says,—"I suppress the anatomical considerations which the examination of this head suggests, and which might indicate a kind of correspondence between certain physical injuries of the brain, and some remarkable changes, effected in the functions of the understanding."

He seems, in short, to have familiarized himself with this idea : he says, in the article *Alienation**—“Con-

* Dictionnaire des sciences médicales, T. i. p. 313.

genital idiocy appears almost always to be connected with an original defect in the brain; incapable of undergoing any kind of transformation, and as durable as the cause by which it is occasioned."

The brain represented in pl. xviii. fig. 11, from Willis, belonged to a young man imbecile from birth;* pl. xix. fig. 1, is the head of a man, aged twenty-six, who was born completely imbecile.

In the collection of the School of Medicine, is an equally small cranium, which belonged to a perfectly imbecile child.

The little cranium, pl. xviii. fig. 1, is that of a girl, seven years old, who was born in the same state. The cranium and head, pl. xx. fig. 1 and 2, belonged to a girl, twenty years old, also absolutely imbecile.

In our travels, we have had occasion to observe several individuals, totally imbecile from birth, who are still living, and remarkable for small heads. At Mannheim, Professor Schüler showed us a family constituted as follows: the father has a head rather small, and squints; the mother is well organized. One of the boys, four years old, is affected with a kind of paralysis and marasmus; his head is remarkably small, and his face pretty large; his forehead is contracted, and very retreating; the occiput is entirely flattened, and the head generally is but a little larger than that presented to me by Professor Bonn, of Amsterdam. One side of the right parietal is sensibly higher than that of the other; the whole of the child's left side, also, is more completely paralyzed and atrophied than the right. The second boy, aged two years, has also an extremely small head; it is spherical: this child is constantly affected with convulsive motions: both are perfect idiots, and live entirely upon milk. A boy, four years old, in a similar state, was brought from Ghent to Paris: the form and dimensions of his head are the same as those

* *Cerebri anatome, Amstelodami, 1667, in 12, p. 30.*

of the cranium, pl. xx. fig. 1. A short time ago, a boy was shown to me, whose head has also the same form and dimensions: this child has never manifested the least degree of intellect. Dr. Spurzheim has sent me, from London, a drawing of the head of a complete imbecile, which perfectly resembles that shown on pl. xix. fig. 1.

Richerand mentions three idiots, the capacity of whose skulls is extremely small.*

Cabanis speaks of children, the state of whose brain utterly precludes the ability to think. He had occasion to examine one of these automata. "Its stupidity was occasioned by the extreme smallness and malformation of the head, which had never had any sutures. It was born deaf. Although its eyes were in a pretty good condition, and appeared to receive some impressions from the light, it had no idea of distances; yet, in other respects, it was quite healthy and strong, and ate with avidity. When eating, if it were not rapidly supplied with one morsel after another, it fell into violent agitations. It was fond of grasping whatever fell into its hand, particularly animated bodies, whose gentle warmth, and, I believe, whose emanations, appeared to give it pleasure. The organs of generation were in a precocious state of activity, and there were frequent proofs that they strongly attracted its attention."†

These heads, measured immediately above the superior arch of the orbit, and the most prominent part of the occipital, are from eleven to thirteen inches in circumference. They measure, from the origin of the nose to the posterior part of the occipital, from eight to nine inches; they consequently contain as much brain as the head of a new-born child, that is, a fourth, fifth, or sixth of the cerebral mass of an adult, in the full enjoyment of his faculties.

* Nouveaux éléments de physiologie, 8th edit. t. ii. p. 194 and 195.

† Rapport du physique et du moral, t. i. p. 150.

The perfect exercise of the faculties is absolutely incompatible with a brain so small, and there always exists in such a case idiocy more or less complete : to this rule no exception has been or ever will be found. Why then shall we not render homage to truth ? why not establish it as a principle, that there does exist a direct relation between imbecility and the mass of the brain ? *

Fodéré attributes the intellectual deficiency of the Cretins (with small heads) to the unequal distribution of the *vital principle* accumulated towards the organs of vitality and generation, and withdrawn from those of feeling.†

Certainly experience by no means proves, that the organs of generation in this unfortunate class of beings are always very active. I know several individuals, of this class, who have not the slightest idea of the difference of the sexes.

It is not astonishing, that Fodéré does not invariably find imbecility connected with a small head. Observe the manner in which he expresses himself : " We might almost affirm that insanity would be general in hot and dry countries, and especially on the coast of the Mediterranean, if contraction of the cranium at the temples were a sign or cause of this disease. At Marseilles, August 15, 1814, I saw a procession of *St. Laurence*, composed of fishermen and sailors, all of whose craniums were small and very much contracted laterally. I had previously remarked the same thing in several villages in the maritime Alps, on the occasion of proces-

* The orang-outang has not quite the same quantity of brain as the imbeciles of whom we have been speaking ; and this refutes Buffon, who maintains that the orang-outang has as great a cerebral mass as man ; from which this author thinks the conclusion legitimate, that the brain is not essential to the exercise of the moral qualities and intellectual faculties.

† *Du Delire*, t. i. p. 316.

sions, ceremonies, which afford great opportunities to observers in the art of physiognomy." *

This law of nature, relative to heads from eleven to fourteen inches in circumference, becomes more fully confirmed by the examination of heads from complete imbecility, to the ordinary exercise of the intellectual faculties exclusively. The measure is comprehended between the following limits: the periphery above mentioned varies from fourteen to seventeen inches; and the arc between the origin of the nose and the occipital foramen, nearly twelve. These dimensions are accompanied with a greater or less degree of stupidity or fatuity, inability more or less complete of fixing the attention on a determinate object; vague sentiments, indeterminate and transitory affections and passions, an irregular train of ideas, speech consisting of broken phrases, or merely of substantives or verbs, as to eat, to walk, to play, &c. blind and irregular instincts, or an almost entire absence of them.

We had, at Paris, a very remarkable dwarf—Babet Schreier, born at Siegelsbach, a village near Manheim. This girl, when born, was six inches in length: at the age of seven years and one month, she had attained the height of twenty-three inches. At the time of her birth, she weighed a pound and a half; at this age, eight and one fourth pounds. A description of her has been published by Dr. Dornier.† Relative to the intellectual faculties of this child, he speaks in the following manner:

"The intellectual functions of this girl have been backward; they are very little developed for one of her age; she has scarcely more intelligence than children four years old; like them she is subject to little caprices, but this is to be imputed, in a great measure, to bad

* Du *Delire*, t. ii. p. 88 and 89.

† Description d'une miniature humaine, ou tableau historique d'une fille naine; par A. M. Dornier. A Paris, de l'imprimerie de J. Smith, 1817.

education. She has hitherto been taught childish manners only ; her disposition is naturally sweet, caressing, gay, lively, sportive ; she is susceptible of affection and attachment to those who show her attention ; she is fond of company, dress, toys, and pieces of money ; is inquisitive, and has considerable power of imitation, which bespeaks perfectibility, and she repeats quite well what she is taught to say. If instructed in the principles of education, she would probably learn with ease ; her intelligence and memory afford a presumption, that attempts to instruct her would not be unsuccessful ; she never has a more pleasing appearance, than when one endeavors to fix her attention upon any thing, as in showing her how to read. If her attention were fixed for several hours each day, she would soon lose the habit of squinting and gesticulating, the effect of habitual absence of mind, and being left to herself, which diminish her natural charms. Her look would be very agreeable and expressive, if the motion of her eyes were properly directed. She is much more disposed to mirth and more docile, in the afternoon than in the morning ; seems to feel flattered by the visits made her ; testifies her satisfaction by a mere joyful air, and greater pliancy of character ; then her countenance lightens up, and her strength appears to increase with her gaiety ; and if she runs, she manifestly wavers less when thus excited ; she does not like to be severely reproofed, and is much more docile when gentle means are used. Being unaccustomed to fix her attention, or to listen to what is said to her, she comprehends with some difficulty what is addressed to her, and her judgment, for want of exercise, is slow and perplexed. Nevertheless, having heard French spoken for two months, she understands nearly as well as a child, relative to things habitually spoken of.

"She did not begin to speak until four years of age ; but she understood all that was said to her. She actually endeavors to express her ideas, which seem to flow in rapid succession, in a kind of German jargon to

which she is accustomed ; she accompanies her attempt with many gestures, which indicate a perfect correspondence between the moral nature, and the animated precipitate movements of the physical. She does not speak German well enough to maintain continuous conversation ; besides, her mind is too little cultivated to accomplish this ; she speaks only a few French words ; being accustomed to the German, she finds some difficulty in pronouncing French. I am convinced, by careful observation, that this little being enjoys the same natural moral sensibility as any other individual."*

This young girl is far from having *the intelligence of children four years old*. *She has hitherto been taught childish manners only*, for the very good reason that she is incapable of any others. *She has considerable power of imitation, which bespeaks perfectibility* : apes and idiots have also the power of imitation. Besides, Babet Schreier has this power in a very inconsiderable degree. She combs her head indeed, but very badly. With all her repeated attempts, she cannot put up her hair well in papers ; she can never succeed in putting a band round her head ; and, in attempting it she places it wrong side outwards, so that the pearls, with which it is decorated, are underneath. *She repeats quite well what she is taught to say*. So far from being able to repeat whole periods, she finds much difficulty in pronouncing intelligibly a few isolated words. *If instructed in the PRINCIPLES OF EDUCATION, she would probably learn with ease* ; *her intelligence and memory afford a presumption that attempts to instruct her would not be unsuccessful*. She will never be susceptible of instruction ; she will never have a distinct sentiment of her own existence ; she will never have an idea of the difference between her own condition and that of a well-formed person ; for she can never grasp a series of ideas expressed in a period. She is

* L. c. p. 18—21.

habitually absent in mind, and amuses herself whole hours with the same toy, not appearing to remember that she has already used it a hundred times in the same manner. How can she be made to lose the habit of squinting? By what means can the motion of her eyes be properly directed? Being unaccustomed to fix her attention, or listen to what is said to her (that is, incapable of doing so) is the very reason that her judgment is slow and perplexed. But it is by no means to be imputed to want of exercise. Has she not seen more of the world than children generally? But the fact is, her judgment is not susceptible of being exercised.

She actually endeavors to express her ideas, which seem to flow in rapid succession, in a kind of German jargon to which she is accustomed. It is true that she has sentiments and ideas, which rise suddenly and disappear in the same manner, and that almost all her gestures are in unison with these ideas and sentiments; very frequently, however, she makes grimaces which give her an air of imbecility: but she speaks German quite as little as French, and, as I have already said, is at most capable of repeating intelligibly a few isolated words. I have never heard her begin a sentence of her own accord. Dornier himself is compelled to acknowledge: *besides, her mind is too little cultivated to accomplish this;* her mind is little cultivated, because it is not susceptible of cultivation. She possesses moral sensibility, that is to say, is susceptible of joy, anger, &c.; but these affections are vague, transitory, and are excited by the most insignificant objects, as is the case with very young children, and the imbecile.

"The circumference of the head," says Dornier, "measured horizontally from the forehead to the occiput, is thirteen inches and four lines."* I have measured it, by carrying a thread over the most prominent

parts of the forehead and occiput, and found it thirteen inches and nine lines.

"The cranium exhibits no remarkable deformity, except that the forehead appears a little prominent near the middle, because the protuberances of this bone are not very projecting."* If the *protuberances of this bone were more projecting*, it would not prevent the forehead from being *prominent*, and I do not see why Dornier calls this prominence a *deformity*. This prominent and perpendicular forehead is indeed the physical cause of her possessing any faculties; for, in this region is placed the organ of educability, which implies the faculty of being instructed by means of external objects. If the forehead was as little developed as the rest of the head, this child would undoubtedly be as completely imbecile, as those individuals whose heads are represented in several plates of this work, as too diminutive.

I sometimes meet with children, ten or twelve years old, who have very large occiputs, but narrow and low foreheads: these children learn with extreme difficulty, what is taught them, although their *sensibility* is excessive.

Children from two to twelve years old generally have the periphery of their heads from eighteen to nineteen inches, and the arc, from the origin of the nose to the occipital foramen, twelve or thirteen inches. In many children of either sex, at the age of two years, the periphery is from eighteen to eighteen and a half inches, and the arc, above mentioned, twelve inches. In some individuals of remarkable talents, the periphery amounts, between the ages of eight and twelve years, to twenty inches; sometimes, but seldom, even to twenty inches and a half. We see, then, that the completely imbecile individuals of whom I have been speaking, even after having come to their growth, have a much less cerebral

mass, than well-formed children from two to twelve years old.

Those who are partially imbecile sometimes enjoy, in an eminent degree, the exercise of certain moral qualities and intellectual faculties. In the first volume, I have cited individuals remarkable for order; others who had an irresistible propensity to steal, burn, assassinate; others, still, who were excessively lascivious. A head which measures seventeen inches in circumference, and about eleven from the origin of the nose to the occipital foramen, contains half as much brain as that whose corresponding dimensions are twenty, and from thirteen to fourteen inches, and three times as much as an imbecile of the first class.*

Heads eighteen or eighteen and a half inches in circumference, are small, although not incompatible with the regular exercise of the intellectual faculties; they indicate a pitiful mediocrity, a slavish spirit of imitation, credulity, superstition, that species of sensibility, which, by a trifle, is raised to the height of joy, or plunged in an abyss of tears, a judgment rather fallible, an extreme difficulty in discerning the relation of cause and effect, a want of self-control, and frequently, what is a happy circumstance, few desires.

With this degree of development, however, there may already exist distinguished qualities and faculties, because several particular organs may have become highly developed, as sometimes happens in young children of either sex. This is the case with those, in whom we observe a striking contrast, between the prominence of one faculty and inconceivable mediocrity of all the others.

* We may judge now, what a want of fidelity to nature, has been shown by artists, who, according to imaginary proportions of beauty, give to their statues, and especially to their Venus, so small a head. These artists, as well as their admirers, are utterly ignorant of the laws of the cerebral influence over the exercise of the intellectual faculties.

As we come to brains of greater magnitude, we perceive the intellectual faculties increase in extent, until we find heads twenty-one or two inches in circumference, a limit at which man attains his maximum of intelligence.*

Some ancient sculptors, as I have before remarked, appear to have been sensible of this truth ; they gave to their philosophers, heroes, gods, and sovereign pontiffs much larger heads, than they did to their athletes and gladiators. Their Jupiter is particularly distinguished for the great dimensions of his head : what a difference, in this respect, between a Jupiter, and a Bacchus !

Let it not be imputed to accident, that a head of considerable dimensions co-exists occasionally with distinguished talents. Notwithstanding the objections of self-love, the law is general. I have never found, either in ancient or modern times, any man of great genius, whose head would not be ranked in the last class that I have established, especially if regard be paid to the great development of the forehead. Let the reader examine the busts and engravings of Homer, Socrates, Plato, Demosthenes, Pliny, Bacon, Sully, Galileo, Montaigne, Corneille, Racine, Bossuet, Newton, Leibnitz, Locke, Pascal, Boerhave, Haller, Montesquieu, Voltaire, J. J. Rousseau, Franklin, Diderot, Stoll, Kant, Schiller, &c.

The objection has been made against us more than once, especially at Paris, that Voltaire, with all his vast genius, had a small head, and that we frequently see men of limited abilities with large heads.

Voltaire's skull, and especially the anterior part, has pretty large dimensions ; but Voltaire had a small face, and this occasions the illusion. I met with the same objection at Vienna, in regard to the poet Blumauer.

* The dimensions above, do not determine exactly the mass of the brain ; for, in making the estimates by these measurements, we neglect the cerebral parts at the base of the cranium, the upper part of the forehead, and at the lateral-superior part of the head,

He had also a small face, but his cranium is one of the largest in my collection.

Other individuals have the bones of the face very large, which gives the head, in general, a larger appearance; but still the skull may be of very inconsiderable capacity.

Let me be permitted to show, that in animals, also, a large cerebral mass is singularly favorable to the manifestation of the instincts and faculties.

The mastiff, of a powerful breed, is the largest and least intelligent of all dogs. Although his head appears very voluminous, it does not contain more brain than that of many a pug-dog. It is remarkable, that many of the smaller species of dogs have generally almost as much brain as the larger, such as the mastiff, the great grey-hound, and bull-dog; and very frequently the former have a greater quantity than the latter. Among the large species, the spaniel, and the pointer, have the greatest cerebral mass, and heads the most prominent and arching in front. On examining different individuals of the same species, we shall always observe that the most intelligent, and those distinguished for a particular quality, or faculty, have larger heads than others. The dog Munito, which, under the direction of Castelli, attracted the attention of the curious, sprang from a bitch of the spaniel race, and a setter dog: he had not only a very arching, but also a very broad front.

The same distinction exists in horses, and to such a degree, that, in Swabia, the peasants know perfectly well the most intelligent horses, by their broader and more arching forehead. When they are to pass over dangerous roads, they put on the lead a horse or an ox distinguished by this conformation. I know a jockey, who, from long experience, can distinguish many qualities of horses, by the form and dimensions of the forehead. He prefers those in which this part is broad and strongly arched. For several years I have attended to this sign, and have never found it to fail. Franconi's

horses, whose intelligence every body admires, have uniformly heads of this form.

The grand duke of Baden abandoned to our use, at Carlsruhe, a very large and beautiful horse, but which was stupid, skittish, and absolutely useless. We found in him a much less cerebral mass than in other horses; the anterior lobes, in particular, were extremely small.

Compare, as to the height and breadth of the head, the two kinds of parrots, best known in France, viz. the gray and the green. These two species are of the same size, but, with a little attention, it will easily be perceived, that the head of the gray parrot, which is the most docile, is much broader and higher than that of the green.

This observation is confirmed in all known animals. The principles above established cannot be called in question, except by those who have never consulted nature, or who, from fear of being obliged to render homage to new truths, show an utter disregard to facts.

I have therefore determined, in a general manner, with respect to man, the amount of cerebral mass necessary to the manifestation of the intellectual faculties, in all their different degrees, from imbecility to the most universal genius.

Different degrees of the moral and intellectual dispositions, which co-exist with the same cerebral mass and the same dimensions of the cranium.

In spite of all the facts that I have cited, there is one circumstance, which will probably occasion my readers some embarrassment.

It is true, that, when imperfect development of the brain occasions imbecility more or less complete, there are, as I have already said, striking differences among the individuals of each class. Some commit to memory with great facility; others become dangerous to society, by an irresistible propensity to steal, burn, &c.

Some show an extraordinary love of order, a great ability to remember songs, imitate expressions of the countenance, gestures, &c.

Similar differences are observed among those, whose brains, as to mass, have attained the highest degree of development. The volume of the brain being the same, one individual manifests a poetical talent; another, heroic courage; a third, a talent for philosophy and observation; a fourth, artifice, cunning, a spirit of devastation, &c.

Here, all that can be said of the brain, considered merely in reference to its mass, must prove abortive. According to the physiologists whom I have cited above, and who measure the cerebral mass, either in reference to itself, or the other parts of the body, if the mass of brain be the same, we must expect not only the same faculties, but also that they will exhibit nearly the same degree of manifestation. But experience teaches us quite the reverse; with equal mass of brain, we find the most marked differences, both in regard to the moral and intellectual character. We do not here refer to those shades of difference, which might arise from the constitution of the body, &c. We speak of essential differences, the manifest work of nature, which, in these cases, triumphs over all external influences. In spite of outward obstacles, one devotes himself to mathematics; another to poetry; a third plunges into the abyss of pleasure; a fourth consecrates himself wholly to pious contemplations. How is this variety of propensities and faculties to be explained?

All these difficulties vanish before the eyes of one who has correct ideas in regard to the organization of the brain, and the functions of its different parts. Let the imbecile and the greatest geniuses be considered in reference to the structure of their heads. Each of these heads has a different form from the others; each has therefore different cerebral parts unequally developed; and to this very circumstance are to be ascribed the different species, both of imbecility and genius. All those

men whom I cited on a preceding page, and who, by their eminent talents, became benefactors to the human race, had broad and strongly arched foreheads, because the anterior-cerebral parts were highly developed. All those, on the other hand, who are remarkable for nothing but love of conquest, desire of ruling, love of destruction, inordinate vanity, a rage for combats, cruelty, an irresistible propensity to beastly pleasures, &c., have the superior-anterior part of their heads but slightly developed ; other parts, on the contrary, are remarkably prominent, and simply because the cerebral parts, placed beneath these prominences of the cranium, have acquired a high degree of development. If there is a mixture of noble qualities with those of an inferior order, the form of the cranium is also of a mixed character.

It follows, that a particular moral character, or a particular genius, is not determined by the absolute mass of the brain alone ; but that each particular cerebral part, according to its development, may modify, in some degree, the manifestation of a particular moral quality, or intellectual faculty.

And what is the result of all this ? The necessary consequence is—that the different cerebral parts perform different functions ; that the entire brain is not a single organ ; that each of its integrant parts is a particular organ ; and that there exist as many particular organs, as there are functions of the soul essentially distinct.

But this idea, so fruitful to the philosopher, the legislator, the physician, &c., still meets every where with opposers. I must therefore subject it to a detailed examination. I hope to establish the doctrine of the plurality of organs so firmly, that in future it will be proof against all objections.

SECTION III.

PLURALITY OF THE ORGANS OF THE MORAL QUALITIES AND INTELLECTUAL FACULTIES.

Opinions, upon the difference between the various moral qualities, as also between the various intellectual faculties ;—relative to the plurality of the organs, and their situation.

By the word *soul*, the Greeks, according to the usage of Thales, designated the vital principle in general ; hence, they spoke of the *soul of plants*, the *soul of animals*, the *human soul*. This common term *soul*, applied to all that has life, was found insufficient, and it became necessary to designate, by a particular name, that which elevates man above the brute ; the term *mind*, therefore, was used to signify the superior faculties of man,—and *reason*, the most distinguished faculty of the mind. It was very natural to consider the powers of different living beings, as essentially distinct. For the *vegetable soul* may subsist without the *sensitive animal soul*, and this latter, without the *spiritual soul of man*.

The disciples of Pythagoras, Saint Paul, Galen, Gilbert, Gassendi, Bacon, Van Helmont, Wepfer, Willis, Leibnitz, Frederic Hoffmann, Haller, Messrs. Blumenbach, Barthez, Casimir Medicus, Reil, and many others, were equally in favor of different principles for the different functions, both of man and animals.

Saint Augustin, also, made a rigorous distinction between the qualities common to man, and other animals, and those which are peculiar to the former. The

ancients often speak of a *rational soul* and a *brute soul*. Some admit both to be material, and distinguish the rational soul simply by its greater degree of subtilty; others suppose that the brute soul is only corporeal, and that the rational soul is spiritual. Plato made a distinction, in the brute soul, between the *appetitive* and *perhorrescent faculties*, and regarded anger, courage, love, &c., as distinct powers. According to several ancient philosophers, the material soul was endowed with the faculty of receiving impressions, a faculty which they called *imagination*; they designated the power of retaining impressions, by the name of *memory*. Hence, until the present day, imagination and memory have been regarded as material qualities, dependent upon organization, and *reason*, on the contrary, as a faculty essentially spiritual, independent of all organization.

Those who, like Aristotle, Anaxagoras, Stahl, and others, admitted but one soul, one simple principle, the cause of both life and thought, were obliged to ascribe to it at least several powers totally distinct. Malebranche distinguished two fundamental powers of the soul, *the understanding* and *the will*. Condillac entirely separated the passions from reason. Ordinarily, the faculties of the soul are denominated the *intellectual* and the *appetitive*. The intellectual faculty is subdivided into the *perceptive faculty* or *attention*, *memory* and *judgment*; the appetitive faculty, into *propensities*, *affections* and *passions*. These subdivisions are also further subdivided. Thus, Vieussens admits, for example, two imaginations, the one capable of representing present objects only, whilst the other extends to absent ones, which however it represents in an isolated and confused manner: this faculty does not take the name of memory, except when order prevails among the objects represented. Some distinguish THE MEMORY into *local memory*, *memory of words*, and *memory of things*; others make four distinct species of memory: *Local memory*, *memory of words*, *memory of time*, and *memory of cause and effect, or, of causality*.

Nothing more remained, but to assign a seat, an organ to all these souls and all these powers.

If we call by the name of soul, the vivifying principle, each part has its particular soul, its own vivifying principle, its own organic and animal life; in other words, its own peculiar soul.

With the exception of Aristotle and the Perepatetics generally, all the philosophers placed the *rational soul* in the head, the *brute soul* in the trunk, and the *sensitive or vegetative soul* in all parts, without exception. Those who admitted but one soul, placed the *intellectual faculty* in the head, the *appetitive faculty* and the *passions* in the trunk, and each particular quality or affection, as hope, love, envy, courage, sorrow, &c. in some particular part.

The cerebral cavities have acted a distinguished part in all ages. The Arabs placed *common sense* in the anterior cavities, *imagination* in the second cavity, *judgment* in the third, and *memory* in the fourth. Others thought it more natural to look for the seat of certain faculties in the solid parts, rather than in the cavities. For several centuries, it was generally admitted, that the cerebrum was the seat of the *perceptive faculty*, and the cerebellum that of *memory*; for this reason, the occiput was called the mnemonic bone; and many learned men thought that a very prominent occiput was a sure sign of an excellent memory. The pedagogue Vockerodt thought he could determine with certainty the degree of memory, by feeling the posterior part of the head. Carpus places memory behind the ear.

Gregory, of Nice, compares the brain to a city, where the coming and going of the inhabitants occasion no confusion, because each one has his fixed point of departure and definite place of arrival.

Albertus Magnus, bishop of Ratisbon, in the thirteenth century, sketched a head, upon which he marked the seat of the different intellectual faculties. He placed in the anterior part of the forehead, or the first cerebral

cavity, *common sense* and imagination ; in the second cavity, *understanding* and *judgment* ; in the third, *memory* and the motive powers.*

Mundini of Luzzi, who lived in the fourteenth century, supposes that cellules exist in the brain, each of which is the seat of a particular intellectual faculty.

According to Servetto, the two anterior-cerebral cavities receive the images of external objects ; the third is the seat of thought, what is called the aqueduct of Silvius, the seat of the soul ; and the fourth cavity, that of memory.

In a work of Petrus Montagnana, published in 1491, is found an engraving, in which are represented *sensus communis*, *cellula imaginativa*, *cellula estimativa seu cogitativa*, *cellula memorativa et cellula rationalis*. Ludovico Dolci has furnished a similar plate ; he places in front, *the common sense* ; immediately behind, *imagination* ; the *understanding*, in the cerebellum, and in its lowest part, *memory*.

Willis regarded the corpora striata as the seat of the perceptive faculty and the sensation ; the medullary part of the brain, as that of *memory* and *imagination* : he placed *reflection* in the corpus callosum ; and supposed that the cerebellum furnished the vital spirits necessary for voluntary motion.

Vieussens located the imagination in the centrum ovale ; Lancisi and La Peyroney supposed all the senses lodged in the corpus callosum ; Charles Bonnet attributes a peculiar function to each fibre of the brain.

Haller and Van Swieten thought that the internal senses occupied in the brain places as distinct as the nerves of the external senses. But they deemed it impossible to decipher the brain, and assign the origin of

* Upon the authority of this, *Berard and De Montegre*, thus express themselves : " Albert the Great presented it in almost all the details into which it has been carried at the present day." *Dictionnaire des Sciences Médicales Cranioscopie*, t. iii. p. 304.

the nerves of sense, the seat of *memory, judgment, &c.**

Cabanis expresses a similar opinion, when he says,— “A distinction having been made between impressions received through the external senses, those peculiar to internal organs, and those caused by a direct action in the heart of the sensitive organ, it might with some reason be asked, whether the division of the senses is complete, and whether there are really more than five in number. Surely, nothing is more certain, than that impressions referred to the organs of generation, for example, differ as much from those of taste, and impressions pertaining to the operations of the stomach, from those of hearing, as those peculiar to taste, and hearing differ from those of sight and smell. The effects produced by the direct action of different causes upon the nervous centres themselves, have also very peculiar characters ; and the ideas and propensities resulting from these different orders of impressions, are necessarily characterized by their organ. However, as it seems impossible, as yet, to circumscribe them with sufficient precision, that is, to refer each product to its instrument, each result to its data, a rigid analysis rejects, as premature, the new divisions which present themselves ; and as the sense of touch is a general one, which answers all purposes, these new divisions, perhaps, will always be regarded as useless.†

Mayer † did not consider it by any means probable, that the soul performed these various functions, so different from each other, in one and the same region of the cerebrum. He was strongly tempted to consider the cortical substance as the seat of memory, and the cerebellum as that of *abstract ideas*.

* *Van Swieten*, t. i. p. 454.

† *Cabanis*, Rapports du physique et de moral de l'homme, (2d edition,) t. i. p. 233 et 234.

‡ Anatomisch-physiologische Abhandlung vom Gehirn, Ruckenmark und Ursprung der Nerven Berlin, 1779, p. 58 et 59.

Prochaska, also, thinks it very probable, that a particular organ is assigned to each of the internal senses. He coincides with Boerhave in the supposition, that the seat of the *perceptive* faculty must be very remote from that of the *imagination*; because, during sleep, the imagination may be in a high state of activity, whilst the perceptive faculty is inactive. This is the reason, says he, that in sleep the ideas are so confused, and do not begin to recover their distinctness, until the perceptive faculty awakes.

Platner supposes the existence of a *superior* and an *inferior organ* of the soul.

Malacarne does not think the medullary substance of the cerebrum capable of receiving indiscriminately every species of impressions and sensations. He denies the existence of a point, in which all the nerves unite; he regards the cerebellum as the seat of the *superior intellectual* faculties, and thinks, that a measure for these faculties may be found in the number of folds, composing the cerebellum of any individual.

Chenet, Wrisberg, Tiedemann, Richerand, and most of the modern physiologists, think that nature must have had a determinate object in view, when she formed the integrant parts of the brain, so numerous and so diverse, and they suspect that each of these parts must have a peculiar function. Hence, Cuvier, who appears elsewhere * to express a different opinion, says, in his report upon the progress of science, that my doctrine upon the functions of the brain, contains nothing contradictory to the general notions of physiology.† After relating that Broussonet had lost the memory of substantives and proper names, he proposes the following question: "Does memory, that incomprehensible power, reside in as many distinct habitations as there are

**Leçons d'Anatomie comparée*, t. ii.

†*Rapport historique sus les progrès des sciences naturelles, depuis 1789, et sur leur état actuel*, p. 193.

species of memory?" Previously, Cuvier had flattered himself with the idea of having found, in the different magnitude of the corpora quadrigemina of the frugivorous and carnivorous tribes, an explanation of the two instincts, by which the former are led to feed upon plants, and the latter upon animals.*

Degerando has quite as little expectation as Haller, Van Swieten and Prochaska, that we shall ever be able to determine, with certainty, the organs of the different intellectual faculties: he admits, however, an essential difference between the different functions; and explains the association of ideas in the following manner: "A vibration, says he, which takes place in one organ, is communicated to another or to several, and awakens the impressions deposited there."† consequently, this metaphysician admits different organs for the different intellectual faculties.

Sœmmering believes, indeed, that what has been said upon the seat of *perception, reflection, meditation, common sense, the instincts, passions, judgment, &c.*, is in part mere hypothesis; but still, he thinks it probable, that certain kinds of ideas are treasured up in particular compartments of the brain; in a word, that *distinct faculties* occupy *distinct regions* in the brain.

All those, in short, who place the different intellectual faculties and moral qualities, the passions, propensities, instincts, &c., partly in the brain, partly in certain nerves or viscera, in the blood or the temperament, admit, by that very circumstance, a plurality of organs for the intellectual and moral faculties.

Ackermann, who attacks the plurality of organs with so much violence, endeavors, however, to prove, that there must exist certain regions of the brain, in which the impressions are treasured up; and he thinks that these parts are the optic thalami: besides this *inferior*

* *Legons d' Anatomie comparée*, t. ii.

† *Des signes, ou l' art de penser*, t. i. p. 57.

organ of the soul, he admits, with Platner, another of a *more elevated order*, in which thought and the comparison of impressions are carried on: this last organ, according to him, is the medullary part of the hemispheres. In the same passage, he attributes these very functions to his inferior organ, which renders the hemispheres useless.

"In our times," says Bérard and Montégre, "when experiment and observation are conducted so accurately, and hypothesis does not easily gain confidence, it is believed, that different organs exist in the brain: the fact is considered as demonstrated; but it is generally thought impossible to designate these organs individually: such is the opinion of the greatest physiologists in Europe; Scemmering, Prochaska, Mayer, &c., all admit the reality of organology: they hesitate only in regard to designating the organs."*

But if all the physiologists admit the plurality of organs, why do the greater part of them, and particularly Bérard and Montégre, oppose the doctrine, which inculcates this plurality?

Since, as we have seen above,† daily phenomena have presented this plurality to the senses of the greatest physiologists, why has no one of them discovered any of these organs? Is this plurality chimerical, as some, deceived by the circumstance, that no physiologist has found these organs, and seduced by metaphysical reveries, have maintained? or, rather, have all learned men followed a devious course?

In the third volume of this work, I shall endeavor to prove, that, in fact, all the learned have mistaken the way, and I shall indicate, in a chapter specially appropriated, the means which I have used, not only to determine for which of the intellectual faculties and moral

* Dictionnaire des Sciences médicales, art. *Cranioscopie*, t. vii. p. 305 et 306.

† Page 358 and the following.

qualities, particular organs must be sought, but also to fix the seat of these organs. I shall not, like my predecessors, assert, upon the authority of vague glimpses and gratuitous hypotheses, that there may exist in the brain, organs for the different faculties, but I shall undertake to establish, by undeniable facts, gathered from the physiology and pathology, both of man and other animals, that a particular organ is to be found in the brain, for each essentially distinct intellectual faculty and moral quality.

Proofs of the plurality of the mental organs.

To make myself intelligible to all my readers, I am obliged to postpone many of my most important proofs, to the succeeding volumes, in which I shall treat of the primitive powers of the soul and of their organs, and to confine myself here to general points of view. I divide my proofs into *anatomical*, *physiological*, and *pathological*.

Anatomical proofs of plurality in the organs of the soul.

First Proof.

The faculties of animals are multiplied in proportion to the complexity of the brain.

The same progression, that exists in the gradual improvement of the animal organization, so far as vegetative life alone is concerned, is found also in the gradual improvement of the nervous system, and, consequently, of animal life. Comparative anatomy has traced the gradual improvement of animals, from the most simple absorbent vessels, to the most complex apparatus for masti-

cation, deglutition, digestion, and to the most perfect circulation. With each new viscus, each new provision for the senses, we discover a new function, which increases in complexity, with each progressive step towards perfection of the organization of its viscus or sense.

Thus, the stomach, kidneys, lungs, heart, eye, ear, &c. are as much more complicated, as their functions are so.

The same gradation may be demonstrated in the cerebral structure of the different species. In the preceding chapter, I have shown, that the existence of particular qualities, whether moral or intellectual, depends solely on the presence of certain cerebral parts, and not at all on the total mass of the brain. It therefore follows, that the number of the faculties is in a direct ratio with the number of its integral parts. The nervous matter, contained in the cerebral receptacle of insects, fishes, and amphibia, is likewise divided into many distinct masses, of which the greatest part are ganglia, giving origin to the olfactory, auditory, optic, and other nerves, and not integral parts of the brain, properly so called. The two proper hemispheres, whose complexity of structure is proportionate to the number of mechanical aptitudes, are situated behind the two ganglia of the olfactory nerves.

The cerebellum ordinarily forms a pouch, which is sometimes placed in a horizontal direction, and sometimes folded upon itself.

In birds, the two hemispheres are found to be much larger, although no distinct convolutions are yet perceptible. Here, the cerebellum consists solely of the middle or fundamental part, although apparently composed even now of many rings in juxtaposition.

No convolutions, indeed, are distinguishable even in the small mammifera, as, for instance, in the shrew-mouse, the mouse, the rat, the squirrel, the weasel, &c.; still, as they are distinctly formed in other rodentia of a

larger species, as in the beaver, the kangaroo, &c., their existence may be presumed in the smaller species just enumerated.

In the larger mammifera, as the cat, marten, pole-cat, fox, dog, monkey, &c., the convolutions are more numerous and distinct, though their form varies with the species.

The convolutions are still more numerous and deep in the dolphin, in the elephant, and in man, than in the beaver, kangaroo, cat, &c., with an entire difference in form and direction, according to the species.

In all mammiferous animals, the cerebellum has, besides its middle or fundamental part, two lateral parts, which are more or less compound, according to the species. The pons varolii, or the cerebral ganglion, is wanting in all ovipara, and is found in all the mammifera, because the transverse fasces of nervous matter thus styled, are nothing more than the commissure or junction of the two lateral parts of the cerebellum.

The number of integrant parts, or convolutions of the cerebrum, varies in a similar manner in the different species of mammiferous animals. In some of them the anterior lobes are flattened or compressed, in others, they are broader or higher; in others still, the inferior parts of these very lobes are almost entirely wanting. The middle lobes and other convolutions present similar variations.

In this manner, the integrant parts of the cerebrum progressively increase in number and development from a less to a more perfect animal, until we arrive at the brain of man, which, in the anterior-superior and superior regions of the frontal bone, is provided with parts not found in other animals, and to the possession of which man is indebted for faculties and qualities the most elevated, reason, sentiments of religion, and a knowledge of the existence of God.

When we see nature pursuing such a course, how can we continue to doubt, that each part of the brain has its appropriate function, and that the brain of man

and of animals ought, consequently, to be composed of as many particular organs, as man or animals have distinct moral or intellectual faculties, passions, or mechanical aptitudes ?

Objection.

Some learned men maintain, that all the integrant parts of the brain of man can be found in the brain of any other mammiferous animal ; that the brain of an orang-outang is absolutely similar to that of man ; but, since neither the mammifera as a whole, nor the orang-outang, in particular, can compare with man in moral qualities and intellectual faculties, it is impossible to attribute to special cerebral parts, those faculties, to which man is indebted for his superiority over animals.

Answer.

This objection is fundamentally wrong, whether the brain be looked at from the point of view assumed by our predecessors, or from that of our own discoveries. By many anatomists, and, among others, Vicq d' Azir, a great difference had been observed, between the brains of animals and man. They had remarked, that, generally, the hemispheres are smaller, and the corpora quadrigemina larger in animals than in the human race ; and also, that the proportion of nerves to the cerebral mass is commonly greater in animals than in man. Other anatomists, Cuvier, for instance, assert that the hemispheres are much larger, and the convolutions deeper in man than in animals ; they even maintain that many parts, as, for example, the posterior lobes, are wanting in the brains of animals, the only exceptions to this rule being the monkey and the porpoise.

Vicq d' Azir was so convinced of the difference between the encephalon of man and that of animals,

he had so correct an idea of the successive steps of improvement, from one species to another, as to maintain, that by a consecutive and gradual addition of parts, the brain of a fish might be constructed out of the brain of an insect ; that from the brain of a fish, the brain of a bird might be formed ; from the brain of a bird, that of a mammiferous animal, and from that of a mammiferous animal, a human brain ; and that, vice versa, by the successive abstraction of parts, it was possible to reduce the human brain, first to that of a mammiferous animal, and ultimately to that of birds, fishes, and insects.

Buffon was induced, by the incorrect observations of Tyson, to regard the brain of the orang-outang as, in all respects, similar to that of man. Nevertheless, Tyson contradicted himself ; for in one passage he states, that the conformation of the cranial bones of the orang-outang is exactly like that of man, whilst, in another place, he points out a great difference in the frontal bones and orbits. I have already remarked, in the preceding chapter, that the extreme dimensions of the brain of this animal do not exceed those of a new-born infant ; whilst its difference, in outline and convolutions, from those of a human brain, is so great as to be immediately perceptible to the most common observer. Let the brain of the orang-outang (pl. xxxiv.) be compared with a human brain, (pl. iv. and viii.)

It may, however, easily be imagined, why superficial anatomists believed the brain of mammiferous animals composed of the same parts as the human brain ; for in all, are found, according to the old nomenclature, a medulla oblongata, corpora olivaria, and pyramidalia, a pons varolii, crura, thalami optici, corpora striata, a corpus callosum, hemispheres, cavities, &c.

This resemblance, however, ceases the moment we take into consideration those cerebral parts, which constitute organs. These opinions have been corrected in the first volume of my large work, in the section on the structure of the brain ; in that place, I have entered into

all the necessary details. Here I will merely recapitulate the principal points.

At the period, when the integral parts of the brain were designated by those inappropriate names, which I have rejected, the general law, relative to the origin of the nerves, their successive additions and final expansion into a nervous membrane, had not yet been discovered. The design of the ganglia, and of the nervous plexus, was still unknown; it was still a hidden truth, that no nervous system, as, for example, the auditory nerve, the optic nerve, the olfactory, the pairs from the medulla oblongata, &c., arises directly from a single origin, and that, consequently, no nerve is complete from the moment of its origin; it was yet unknown, that the first nervous fibrils of a sense, are strengthened by accessories arising in another place, and that this nerve of sense does not attain its perfection, until many similar additions have been received, and that not till then, does it expand in the form of a very delicate net-work, over the organ to which it is appropriated. Still less was it imagined, that the rudiments of the cerebral hemispheres, of which a faint commencement may be perceived in the medulla oblongata, are augmented by accessories from the pons, the optic thalami, and the striated bodies, are finally expanded into nervous couches and form convolutions, to which the gray substance, covering them, sends yet other nervous fibrils, giving to the hemispheres a much greater volume than they could possibly have had, were they an appendix only of the crura cerebri, of the optic thalami, of the corpora striata, &c. It is this very mass, which, on dissecting the brain, was cut transversely, and which was not considered as deserving any attention, or, at the best, was viewed merely as a secretory organ.

Of the parts just enumerated, and hitherto regarded exclusively as integral components of the brain, not one is a complete organ of any function whatever. They are merely the systems, which originate and strengthen

the nervous fibrils, whose final expansion forms a perfect organ. Thus, the layer of gray substance on the inferior-anterior surface of the brain is not, in itself, an organ, but it gives origin to many fibres of the olfactory nerve; neither is the bulb of gray substance seated over the cribriform bone, an organ; yet from it arise fibrils, which unite with and enlarge the olfactory nerve, until at last, diffusing itself over the pituitary membrane, it assumes the character of a complete olfactory organ.

The more complete an organ is intended by nature to be, the more important, numerous, and perfect are its systems of supply.

The gray substance on the anterior-inferior surface of the brain, is much thicker in most of the mammiferous animals than in man, and also of greater extent; for, it entirely covers the anterior-inferior portion of the middle lobes, and the inferior portion of the anterior lobes. The number of nervous fibrils, which arise from every point of this layer, is infinitely greater in the mammifera than in man. The bulb upon the cribriform bone, is likewise more voluminous in them; and hence the olfactory nerve, originally of greater size, receives from it more numerous filaments, and therefore becomes capable of wider diffusion over the pituitary membrane, that is to say, of constituting a much more perfect olfactory organ.

The fundamental and essential systems are, nevertheless, the same in the mammifera as in man. Consequently, we shall every where meet with a medulla oblongata, a cerebral ganglion, (pons varolii,) optic couches, corpora striata, corpus callosum, &c.; which are larger or smaller, more or less perfect, as they give origin to organs more or less perfect. Hence the cerebral ganglion, (pons varolii,) the optic couches, the striated bodies are much more voluminous in man than in the horse and the ox; hence the hemispheres, which are simply productions from the generating and accessory systems just enumerated, are much smaller in these animals than in the human species.

Whenever, then, the structure of the brain, as an assemblage of organs of intellectual faculties and moral qualities, is considered, we must take into account, not merely the systems generating the organs, but also the greater or less perfection of the organs themselves. Assuming this as a starting point, we shall be convinced how far the human brain exceeds, in perfection, that of animals, especially in those parts appropriated to the moral and intellectual faculties.

Objection.

Portal, to save himself from the necessity of recognizing even the cerebellum and cerebrum as distinct organs, and thereby acknowledging a plurality of the organs, asserts that both of them execute the same functions, and that, in disease, one may replace the other. "Are not both of them," he says, "provided with cortical substance and medullary substance? Are they not traversed and nourished by the same vessels?"

Answer.

The spinal marrow, and the nerves of sense, are composed of cortical and medullary substance (medullary or nervous fibrils;) as a consequence of their composition, neither of these systems should possess its appropriate and peculiar functions, and both might not only reciprocally replace each other, but might even serve as a substitute for the cerebrum and cerebellum. If, as admitted by Portal, the cerebellum replaces the cerebrum in disease, in health, what end do they both answer? True, the organs of animal life are double; that is to say, there are two parts having the same action, one on each side; there are two olfactory nerves; two auditory nerves, and the two hemispheres, both of the cerebrum and cerebellum, are of the same nature; but,

in no case do we see parts, not having the same action, replace each other in the execution of their respective functions.

Objection.

Buffon maintains, that no difference can be found between the brain of an imbecile and that of one in the enjoyment of all his intellectual faculties, and, consequently, that it is impossible to admit the dependence of intellectual excellence on the perfection of the brain.

Answer.

Buffon may, possibly, have observed some persons of deficient intellect, whose heads presented nothing extraordinary, either in shape or size. I have myself met with similar instances, in which the individuals have been idiots from birth, though most of them had become so accidentally, from cerebral diseases, which had terminated unfortunately from masturbation; and no one certainly will maintain the nonexistence of structural derangement in the brains of these individuals.

However, I advise the reader to reflect upon what I have said, (sect. ii.) on imbecility, and the condition of the brain and cranium of idiots: the statements there made, completely refute the opinion of Buffon. Malacarne, moreover, has observed, that all the cerebral parts are far more distinct in those who are possessed of superior powers, and that the intellectual faculties and moral qualities are uniformly found to be in proportion to the perfection of the brain. Let the brain, (pl. viii.) of which the convolutions are ample and well developed, be compared with that of pl. ix., where they are small and contracted.

Second Anatomical Proof.

The analogy between the organization of the brain, and that of the other nervous system, proves the brain to be composed of many organs.

The nervous system of vegetative or automatic life, the spinal marrow or the instruments of the nervous system of voluntary motion, the nervous systems of the organs of sense, are respectively composed of particular organs, presiding over a particular viscus, a particular voluntary motion, or a particular sense. Each one of these subdivisions has its special origin, its accessory system, and its final expansion in a viscus, in one or more muscles, and in an external organ of sense.* By means of this arrangement, each particular nervous system has its appropriate function, and no one of them can supply another's function.†

The same law presides over the arrangement of the brain. The convolutions are the expansion of the cerebral fibrils, and the fibrous fasces. The convolutions, so far as they constitute organs, receive fibrils from different regions and systems of supply, as, for example, from the optic couches and striated bodies, so styled, or from different points of these same parts.‡

In the first volume of my large work,§ I have indicated many of the nervous fasces, whose enlargement and expansion from the convolutions of the hemispheres, and of which, figures may be found, pl. iv. i. c. pl. iv. i. c. m. m. Moreover, as lesions of the brain do not uniformly exhibit their effects on the side opposite

* Vid. the large work. T. 1, p. 312 and seq. Description of the brain.

† Ibidem. On the difference of the nerves, p. 127.

‡ Ibidem.

§ P. 271.

to that on which the injury was inflicted, as is the case in injuries of those parts which form a continuation of the pyramidal bodies, the conclusion is inevitable, that all the encephalic parts do not have the same origin, or, in other words, that there are cerebral parts, whose fibrils intersect each other at their commencement, and others, whose fibrils continue distinct.

From this coincidence of structure between the brain and other nervous systems, it is clearly proved, that nature designed, in the formation of the former, to create many organs, just as much as she had this end in view in the subdivisions of the latter.

Objection.

"The cerebral parts," says Rudolphi, "are not sufficiently dissimilar, to allow them to be considered as distinct organs. They are all formed of the same substances; the distribution of which may vary somewhat; and all, even those situated in the interior of the brain, are intimately united. The pineal gland and the striated bodies, for example, differ very slightly. The same substances, though their proportions may vary somewhat, are invariably found. The form of the cerebral parts is not, in truth, uniform, but the number of exceptions is very limited. Setting aside the cerebellum, the pons, crura, striated bodies, pineal gland, corpora mamillaria, olivaria, and pyramidalia, what parts remain, which have any pretensions to be viewed as special organs?"

Answer.

How different is this language from that of other physiologists, who consider it as a demonstrated truth, that the brain is an assemblage of many organs; for, on the

contrary supposition, the necessity of so many parts, so various in configuration, is inconceivable! *

All these parts differ so much, both in form and structure, that it would be far more justifiable to consider them as special organs, than it is to regard as such, the nerves of each external sense.

But I have proved, elsewhere, that the functions can very rarely be inferred from the anatomical structure. I have, moreover, just shown, that all the parts enumerated by Rudolphi, are in fact merely apparatus, which give origin to organs, and aid in enlarging and completing them, and are by no means to be considered as organs, properly speaking. Nevertheless, in the actual state of our physiological knowledge, it was far more excusable to regard these cerebral parts as organs, than to fall into the error of Rudolphi and Dumas.

* Richerand in his *New Elements of Physiology*, 8th ed. vol. ii. p. 166, says,—as many other anatomists have done,—“With much probability might it be conjectured, that each perception, each class of ideas, and each faculty of the understanding, has its appropriate part of the brain. It is, indeed, impossible for us to determine the special function of every part of the organ, to assign the object of the ventricles, the use of the commissures, the operations of the peduncles; but it is equally impossible to study an arrangement so systematic, without being impressed with the idea of design, and that this division of the cerebral mass, into so many distinct parcels so diversely conformed, is relative to the different part each is to perform in the composition of thought.”

After such a passage, would it not be natural to expect from its author, an approval of my researches into the plurality of the organs? Observe, now, his conclusion: “What, then, are we to think of the system of Gall, this division of the exterior of the cranium into so many compartments, whose elevation or depression indicates the possession or deficiency of different faculties, both moral and intellectual? What, but that this physiological doctrine of the cerebral functions, which has been raised upon too small a number of carefully observed facts, is as frivolous, as his anatomical discoveries in the brain and nervous system generally, are useless and chimerical.” Richerand is not only illogical in his conclusion, but he also appears desirous to conceal the fact, that I form no judgment of the different prominences on the cranium except when they are occasioned by the development of the subjacent cerebral parts.

But how can these professors of anatomy assert, that there is but little difference between the pineal gland and the striated bodies, when the former is not so large as a young pea, and the latter has such a complicated internal structure, and is of the size of a hen's egg? I could make allowances more easily for the error of Cabanis and Cuvier, who believed that the nerves differ from each other, neither in substance nor structure.*

Objection.

Bérard and de Montégre, the self-constituted expounders of Cuvier, go so far as to say,—“ Is it, however, well ascertained, that the brain is really composed of independent parts? Certain anatomists, but little imbued with the spirit of philosophy, have, indeed, assigned to them distinct and separate names: common demonstrators describe them in this manner; but, if the brain be attentively studied, and if we apply to it the simple and luminous ideas for which we are indebted to our great physiologists, we shall soon be convinced, that these parts are not distinct and separate organs, but sinuosities and prominences diversifying the faces of the hemispheres. The brain is characterized every where by unity; no marked division can be observed: this anatomical disposition proves the impossibility of placing in it distinct organs. Shall we consider the convolutions as independent organs? Examine their number, and observe how their respective bases are united in a common base, and how by their two extremities they are blended and linked with each other. Penetrate into the interior of the brain, and you will every where find that anatomical unity, which rejects every kind of division into organs. We are indebted to the celebrated

* Rapport du Physique et du Moral, t. i. p. 209.
21*

professor Chaussier, in particular, for our knowledge of this remarkable circumstance in cerebral organization: he has proved, in his description of the brain, that all parts of this viscus are blended together in a common union, and invariably tend towards unity.

These gentlemen were so apprehensive that, from their manner of expression, they might be supposed to disown the brain as the organ of the mind, a proposition which they openly scouted a few pages before, that they conclude in these terms: "This anatomical unity corresponds to the unity of the cerebral functions, but does not, as has been believed, produce it, though, as a condition, it is singularly favorable to such a result."

Answer.

Vieussens, Petit, Vicq d'Azir, Cuvier, and Chaussier, according to M. M. Bérard and de Montégre, are anatomists, but little imbued with the spirit of philosophy, ordinary demonstrators; for all of them have seen in the brain, parts distinct, both by form and composition, and to these different parts have assigned distinct names.

On more than one occasion I have called the reader's attention to the great misfortune of the gentlemen, in citing authorities for their opinions. Let us see, once more, how Chaussier, whom they quote, expresses himself on the subject in question.

"The soft and pulpy substance which composes it, [the brain] is not, as it appears to be, at first sight, a spongy, uniform, homogeneous mass, piled up, without order, in the cavity of the cranium, solely designed to support the vessels, and assist their divisions. Shades of color are distinguishable in it; moreover, on examining it more closely, and cutting into it at different levels and in different directions, it is observed to affect peculiar forms in many places: it presents an uniform arrangement, an extremely regular disposition of its parts. Thus we find in it *ventricles*, or internal cavities, lined

by a delicate membrane, and traversed by a larger or smaller number of vessels; *reliefs, protuberances, striæ, small bands, laminae, partitions*, all differing in position, form, volume, color, and consistency. *Cords and fasces*, more or less large and fibrous, are also found, which pass from one side to the other, interlacing, prolonging, and directing themselves towards certain places, where they seem to unite with and be lost among others.”*

In the same work, the author says,—“In fine, on reviewing all the appearances presented by the very complicated texture of the encephalic organ, it must be acknowledged, that, notwithstanding its fissures, its very numerous divisions, its varieties of form, color, and density, all the parts are intimately united; that all have a direction towards certain points, a termination at the origin of the nerves, and a tendency to form a common centre.”†

If it be an honor to teach an error publicly, the honor of paternity, at least, does not belong to the distinguished Chaussier; for the opinion is as old as that of the mind’s singleness, from which some have been willing to conclude, that the organ of the mind is also single. Chaussier, throughout his whole work, does not allege a single proof in support of this opinion. We, on the contrary, have proved, on the section upon the structure of the brain, not only that there is no common centre for all the cerebral fibres, but that there can be none; and that, to maintain the reunion of the whole cerebral mass, at the origin of the nerves, is to support a statement which contradicts every law of the nervous systems, and the laws pursued by nature herself, in the development of other parts of the body. We have demonstrated, that even the nerves of the senses originate in

* Short exposition of the structure of the different parts of the encephalon, or brain, pp. 15 and 16.

† Ibid. p. 18.

places entirely different; that they may, indeed, by means of communicating branches, act upon the brain, and vice versa; but do by no means arise, either from the proper white substance, or from the cerebral fibres; that most of the nerves of sense, as well as all the spinal nerves, derive no part of their origin from the brain itself, but from the layers of gray substance on its inferior surface; that is to say, from parts not appertaining to the proper hemispheres, as, for instance, from the corpora quadrigemina, or medulla oblongata.

The proofs, which we have advanced, are unanswerable, and, consequently, refute the idea of the unity of the mental organ; an idea, of which the full and exclusive enjoyment should be yielded up by anatomists to the metaphysicians. Is it not ridiculous, when anatomists, who find multiplicity every where, dream of an anatomical unity? They see two distinct hemispheres, both in the cerebrum and cerebellum: is there unity here? They see different voluminous parts of the brain, circumscribed by definite outlines: is there unity here? If the brain be an unit, how is it possible to determine that sometimes one cerebral part, and sometimes another, is wanting in a certain species of animals, in which, likewise, some one faculty or quality is deficient? On this supposition, what becomes of the pineal gland, corpora quadrigemina, corpora mammillaria, optic couches, crura, and pons varolii?

Such expressions as these, "all the parts are uniformly connected and blended together in common union," are equally far from representing what exists in nature. They are fragments of the doctrine which teaches, that the brain is merely a pultaceous mass. This hypothesis does not certainly presume the existence of independent parts, each having its appropriate function; though it would be just as inconceivable, how a single organ, absolutely homogeneous throughout, could present phenomena so different, and manifest moral qualities and intellectual faculties so various and so dissimilar.

The white substance of the brain, moreover, is far from

exhibiting such a commingling of its parts as is affirmed ; no such blending exists : on the contrary, fibres and fibrous fasces are in every part very distinctly visible, the direction in which they run being invariably uniform, though different in each region ; they form their own expansions and convolutions ; they are developed at different periods of life ; their number varies greatly in the various species of animals, &c. Vid. p. v. vi. x. xii. It is true, that all these parts are connected ; but this connection does not prove the impossibility of each being an independent organ. "Between all the organs of the animal body," says Reil, "there is a sort of union ; no one can exist alone ; their preservation is a state of mutual dependence ; this fact, however, should not lead us to the false conclusion, that the proximate cause of an organ's action can be found elsewhere than in itself. For, this is by no means the case ; each organ is independent, acts of itself by virtue of its own powers, and contains directly within itself the proximate cause of its phenomena." The consequence of these objections is obvious : no organ of sense, no viscus, could be a special and appropriate organ ; for all are connected with each other, and with the organization generally.

Objection.

"The organs of sense are distinct and separate ; no parts are found in the brain thus separate."

Reply.

We acknowledge ourselves not yet in a condition to specify the precise limits of all the cerebral organs ; but are anatomists able to state the precise limits of the motor and gustatory nerves of the tongue ? How often would physiologists find themselves embarrassed, if, to

prove the appropriate functions of any one part, a nerve, for example, it were necessary to define its boundaries!

Nevertheless, we have exhibited a profusion of proof that the fibrous fasces are really distinct; that they arise and are augmented, indifferent places; and, finally, that there are different points of union between the congenerous fasces of the two hemispheres of the brain: it is the same with certain muscular masses, in which it is impossible to recognize the different muscles composing them, except from the different direction of the fasciculi of their fibres.

If it were allowable to hazard a supposition on subjects, of which we possess but little certain information, I should be induced to say, that nature may possibly have had her reason, for locating the instruments of the external senses, as well as their exterior apparatus, remote from each other, and approximating the internal senses. The internal senses and faculties were not designed to act independently, as the external senses do; but to react upon each other, to mutually excite each other's action, and lend reciprocal assistance: each of them was designed to aid in the association of the ideas and sentiments, whose progress, succession, and combination, and the acts of the judgment and will, resulting therefrom, would otherwise have been too slow.

Moreover, the spinal marrow, also, is an uninterrupted series of different origins of different pairs of nerves, each of which, has its distinct and independent function. Pl. i. and ii.

In accordance with the received opinion, the medulla oblongata and pons varolii are the reunion of all the nerves, which ought, of course, in these places, to be the most completely blended with each other, and yet, from these very places arise the fifth or mixed pair, the auditory nerves, the motores oculi, the accessory vocal nerve, &c.; but is that any obstacle to the possession by each of these nerves of its peculiar and independent function? Why, then, should a similar arrangement in the brain, prevent its integrant parts from having their

peculiar and independent functions? Finally, why do M. M. Bérard and de Montégre, so pertinaciously contest the plurality of the organs, when a few pages back* they class themselves among the writers, by whom it is admitted, grounding their opposition, not upon hypothesis, but upon those methods of experiment and observation, which, in modern times, have attained to such perfection, without stating, however, where they met with the particular cases to which this new method of observation was applied?

Objection.

"The analogy of the external senses, it is said, is inadmissible, for this reason, among others, that they have their external apparatus, whilst the brain has no mode of connection with the external world."

Reply.

Nature, having designed the external senses to place both man and animal in relation with the external world, was obliged to give them apparatus capable of receiving impressions from external objects. This objection would really have some weight, were it true that all our sentiments and ideas are products solely of the external world and the senses: even in this case, however, the cerebral, internal parts would require to be so disposed, as to receive different sorts of impressions,—in other words, to be specifically different; but in the first part of this volume, I have shown the brain to be a far more fruitful source of sentiments and ideas than the external senses; that its action is internal, and that, if it require the ministry of the external senses,

* P. 305.

the utmost it asks from them is a supply of material. The nerves of the five senses excepted, all the others receive their excitement from within, whether their action be or be not confined within. Even the nerves of sense sometimes exercise their activity without having received the slightest impression from without, of which we have instances in dreaming, mania, &c.

There is, then, no further obstacle to inferring, from the analogy which exists between the structure of the brain and that of the other nervous systems, that there is a plurality of cerebral organs.

Third Anatomical Proof.

The differences of structure in the encephalon of different animals, which are the most striking, correspond to decided differences in its functions.

The brain of animals is almost entirely formed of the parts, seated in the lateral and posterior regions of the cranium. This is the reason, why their heads retreat immediately above the eyes. Nature has bestowed on the more noble species only, the cerebral parts seated in the anterior-inferior part; hence these species, as certain monkeys and dogs, have more or less forehead. Man, being endowed with large anterior-superior, and anterior-inferior encephalic parts, his whole front is expanded; it swells immediately above the eyes, projects beyond them, and rises in a direction more or less perpendicular.

Now, the common qualities of man and animals are, unquestionably, seated in the lateral and posterior parts of the head; and, in proportion as animals have received a share of certain anterior-inferior encephalic parts, they enjoy certain intellectual faculties; but as there is no animal, which possesses all the cerebral parts situated in the anterior-superior and superior-posterior regions of the frontal bone, so there is not one endowed with the faculties attached to them; not one, which enjoys the

privilege of reason, and a susceptibility of religious impressions.

Whenever the two sexes of the same species, exhibit marked differences in their propensities and faculties, the form of their encephalon differs in a manner quite as remarkable. The brain of woman is, ordinarily, less developed in its anterior-superior parts; hence women commonly have the forehead narrower and less lofty than men. On the contrary, those cerebral parts, which determine love for children or young creatures of any kind, are ordinarily much more developed in women, and in females generally, than in man and male animals.

My proposition finds confirmation in the different species of animals. Compare the brain of the carnivorous with the brain of the frugivorous; in the former, in the middle lobes more especially, you will find large cerebral masses, which are wanting in the latter. Compare, again, the brain of a dog with that of the cat, marten, or otter; compare the brain of a stallion with that of the bull, stag, &c., and you will be perfectly convinced, that an essential difference in the composition of the brain, introduces with it a corresponding difference in the character of the animal. Further, compare the brains of different species of animals, whose cerebral mass is nearly the same, but whose habits are essentially different; for instance, the dog with the hog, she-goat, &c., you will be impressed with another very important truth; namely, that the volume of the brain may be the same, and yet its functions be entirely different, and even opposite; and that the instincts, propensities and peculiar characteristic talents are determined, not by the quantity or volume of the brain, but by the quality or selectness of the parts of which it is composed.

I challenge any one whatever, to examine a dozen brains only, of different species of animals, and not be

strongly impressed, that different cerebral parts are appropriated to distinct functions, and, consequently, that the brain is compounded of many organs.

PHYSIOLOGICAL PROOFS.

First Physiological Proof.

In all organized beings, different phenomena suppose different apparatus ; consequently, the various functions of the brain likewise suppose different organs.

The different properties of plants result from the difference, varying modes of combination, and diversified forms of their constituent parts ; and the parts of a plant are as diverse and various as its functions.

The same law extends also to the animal kingdom. Here, likewise, each different phenomenon is produced through the medium of different material conditions. Nutrition, secretion, excretion, circulation, respiration, generation, in fact, all the functions are executed by instruments expressly adapted to the end in view. There can be no particular voluntary motion, no peculiar sensation, unless arising from a particular material condition.

Finally, nature found it necessary to form as many external senses, as there are essentially different species of impressions of the external world, of which animals or man were to be recipients.

Now, it is evident, that the qualities and faculties of which the brain is the organ, are no less essentially different in man, than in animals. The affective qualities and the intellectual faculties, are totally different in their nature ; each propensity, sentiment and faculty, is dissimilar from another. The instinct of singing differs from the instinct of travelling and constructing ; the propen-

sity to propagation, from the propensity to murder, and that of the love of children ; the sentiments of pride and of devotion vary widely ; and who could confound the talent of architecture with that of music, the talent for painting with that for poetry, or local memory with a talent for observation ?

In our exposition of the opinions of a great number of philosophers, upon the plurality of the mental organs, it was seen, that, according to the old received system, they admitted an essential difference between the will and the understanding, between the moral qualities and the intellectual faculties ; that they distinguished memory and perception, from judgment and understanding, &c.

Thus, whether my philosophy or that of my predecessors be adopted, it still remains unquestionable, that the functions of the brain are as diverse as the five senses, and, consequently, that they have a necessity as imperative for different organs.

Objection.

It is impossible to discover any analogy between matter and its mode of action, and mind and its functions ; therefore, no induction, applicable to the mental functions, can be deduced from the corporeal world.

Reply.

Whatever difference may exist between matter and its mode of action, and mind and its functions, it is certain, as I have proved in the first volume, that no quality or faculty whatever, can be manifested without the existence of matter in a certain state, so long as mind is united to the body ; consequently, so long as this union subsists, so long is mind subject to physical condition, that is to say, every manifestation of mind, whatever, supposes a particular apparatus in the brain.

Objection.

"Even supposing that the entity *I*, (*moi*) needs an instrument by which to act, still the act of the will, whatever it may be, must be admitted to precede the organic act; the one is cause, the other, effect; one is power, the other, the instrument; there is, therefore, a moment in which the entity *I*, acts by itself and modifies the organs, instead of being modified by them; so that by multiplying the organs, intermediate to the entity and the manifestation of its acts, the difficulty is merely thrown farther back, not resolved; instead of being simplified, it is complicated. We are finally reduced to return to the first action of the entity, anterior to any organic act. Why, then, not meet at once and without circumlocution, this proposition, which is so singular, but which, nevertheless, all facts confirm? It seems as if it would have saved many hypotheses, and prevented many disputes, had so easy and simple a reflection been made. Is it then so difficult to stop at truth, on a path which becomes impracticable, when we deviate from facts and the comparison of facts?

"It cannot be repeated too often, the animal wills, and action succeeds; he is supreme lord of the exercise of his animal functions: he owns no other cause of his acts, than the will to produce them. Inorganic matter, as well as that which is organized, is subject to fixed and immutable laws, of whose purpose it knows nothing; the intellectual and moral functions alone are free, voluntary, and accompanied by consciousness, and must always be referred to a principle of action, subject only to itself.

"If the intellectual and moral qualities were merely a result of the relative development of organs, appropriated to them, the individual would exert them, nearly like an automaton, or a machine, which goes as soon as it is wound up. There would be no relation between the exercise of the moral qualities and external causes;

the poet would always compose verses ; the musician, music, &c. ; on the other hand, education has a sovereign influence even on the greatest men ; and moral motives are the causes of most actions ; it must then be admitted, that the moral self often acts independently and without organs ; what then is the necessity for this apparatus of distinct and separate organs ? There appears to be a kind of contradiction here. There is no medium ; it must either be allowed, that the moral acts are always involuntary, and therefore irresistible, an opinion which no one has ever dared to maintain,—or, that the entity, *I*, often acts independently without having any particular organs, as specific instruments of its different peculiar acts ; and if it often act in this manner, why not always ? The sum and substance of these facts is, that integrity of the organs, especially of the brain, is essential to integrity of the moral functions ; that from the union existing between the moral and physical nature, lesions of the one induce lesions of the other, and vice versa, in conformity to the original laws of organization ; that the activity of the one in the vital function, sustains and animates the activity of the other in the animal functions ; they are united, but not mingled, and have a reciprocal reaction.”*

Reply.

Facts prove, then, that *integrity of the organs, especially of the brain, is essential to integrity of the moral functions.* An instant previous to this avowal, Bérard and de Montégre affirm, *that the moral functions are absolutely independent of any organ ; that the entity, I, acts itself ; that its action precedes organic action ; that acts of the will are always independent, and uninfluenced by physical instruments, &c.*

* Dictionnaire des Sciences médicales, art. *Cranioscopie*, vii. 311.
313.

If activity of the entity, *I*, precede the development and activity of the organs, and if the entity possess an exclusive privilege of modifying the organs, why does not each entity constitute a perfect body? why does not the entity act in the new-born infant? why is its action dependent on development of the organs? and why does it sink into dotage, when age has brought decrepitude, and impaired the powers of the organs? If the functions of the sentient, *I*, be absolutely voluntary acts, and independent of organization, why do we not all become, what we often so ardently desire to be? What becomes of this free and independent will, in intoxication, in imbecility, in mania, apoplexy, in a swoon, sleep, in cerebral inflammation? If uninterrupted activity be necessary to constitute an innate faculty, why do not animals and man abandon themselves unrestrainedly to the delights of physical love, a propensity to which Bérard and de Montégré will not certainly be willing to deny an innate character? &c.

Objection.

"Let it be granted, say other physiologists, that analogy between the functions of the senses and the mind really exists, still it is none the less certain, that all the functions of the senses can be reduced to *one sensation*; in a similar manner, the mental functions are not near so numerous as, at the first glance, they would seem to be; one, or at most, two principles embrace them all, *perception* and *reflection*; the latter is, in fact, merely a modification of the former. Nature, they add, aims at unity every where, and not the brain only, but the whole animal is a single unit."

"Unity of the animal functions, say Bérard and de Montégré, is another objection to a multiplicity of organs. When anatomists and physiologists sought in the brain for a *common sensorium*, they were undoubtedly wrong; they pushed this idea too far; and though

they did not see that an anatomical centre always consisted of parts, still they felt, that the cerebral functions required union of the organs and concentration of their action. Further, this absolute unity of the moral phenomena proves, that the sentient *I*, wherein they originate, must have a real and positive existence."

Reply.

I have shown, that there can exist in the brain neither a mathematical point, nor even a physical point, wherein all the organs, or all the nerves are united, or towards which all the cerebral functions converge; they, therefore, who regard such a centre as indispensably necessary, grasp at a phantasm.

As there are so many of my adversaries, who study anatomy and physiology in the closet of the metaphysician,—to whom unity of the entity *I*, with plurality of the cerebral organs, is inconceivable; and as for this reason, they pertinaciously reject this plurality, I will submit to their ready understanding the following considerations: in an attack of gout, I experience a painful sensation in my joints; at the same time, I have a severe headache, pains in my bowels and uneasiness at my stomach, &c., &c.: thus at the same moment I am suffering disagreeable sensations, which are very different both in nature and seat. At the very same moment, likewise, I enjoy very pleasant sensations in eating an exquisitely cooked dish, in drinking a delicious draught, or in listening to a welcome piece of news. How will you make unity of the personal entity accord with sensations so diversified, so contrasted, and yet simultaneous?

Does unity of the entity *I*, subsist with so large a number of viscera; the five senses all different; the numerous instruments of voluntary motion; the double hemispheres of the brain, each of which executes the same functions?

Glance at the constructive capacities, the instincts, propensities, talents, and faculties, so varied, so opposite, so differently proportioned in the same individual, and each having its perception, consciousness, and, consequently, its peculiar personal entity. How can you suppose its unity here? How, when, in certain respects, the capacities are extremely limited, and in others, objects of admiration to the world; when the passions, that rule the riper years of manhood, never stirred with their faintest breath the bosom of infancy; when you so often complain of the twofold nature of man, lamenting the struggle between the desires and reason, the strife of propensity against propensity, and the contests waged by the intellectual faculties among themselves; when the faculties are deranged, on one side, by paralysis or irritation, and remain perfect on the other; when there is insanity in a certain train of ideas, and, in every other respect, entire possession of the understanding;—how, I say, in all these cases, can you imagine unity of the personal entity? I am apprehensive, that repeated observation will force you either to renounce this unity, which you so carefully cherish; or, to confess that, whether right or wrong, it is still very convenient, but likewise very illogical, to employ an argument, whose value is purely metaphysical, in opposition to the best ascertained facts.

Sensation accompanies activity of the functions of the senses; and the production of sensation is a function common to all the nerves indiscriminately. But are all sensations of precisely the same nature? When a person says, I have a sensation, does he intimate thereby, I see, I hear? When he wishes you to understand his words, is he not obliged to define the kind of sensation experienced? Has not nature contrived different external instruments, and different internal apparatus, as the media of different species of sensation?

It is precisely an analogous case to attempt to reduce the various intellectual faculties and moral qualities to the faculties of thought and perception. I think! I

feel ! Do I experience desire, or aversion ? And when I have told by which feeling I am actuated, will not further information be requisite ? Am I not forced to specify my idea, my feeling ? Who would be bold enough to maintain, that one sole external object can give birth to ideas and feelings of all kinds ? And is it not sustaining the same thing, to pretend that a single internal organ is suited to the reception of all sorts of impressions, both external and internal ? But such is not the case : to remain consistent and uniform in her course, nature created as many distinct internal organs, as there are different sentiments, propensities and faculties, whose manifestation she wished to render possible.*

Objection.

"With the five fingers, or with one hand," says Platner, "the most complicated pieces of music are executed ; why, then, may not a single organ suffice to execute all the intellectual faculties?"

Reply.

Platner requires, for the execution of music, not only a hand and fingers, which are neither simple nor single, but also an instrument, composed of different parts, and, above all, a brain ; and musicians not only perform music, but other acts essentially different. The opposition of Platner to plurality of the organs is the more astonishing, as he himself, in his Anthropology, admits several organs, a *superior*, and an *inferior organ of the mind*.

* This answer may be applied to all those who wish to reduce the powers of the mind and soul to a few general ideas. We may here say, in the words of Locke—*The more general an idea, the more barren.*

The course pursued by nature, wherever she wishes to produce different results, affords, therefore, a sufficient assurance, that the brain contains a particular organ for each particular mental power.

Second Physiological Proof.

One species of animals is endowed with faculties and qualities, in which another is deficient, a fact that would be inexplicable, did not each particular cerebral function reside in a particular portion of the brain. Suppose I should inquire of my readers, how it happens, that certain species of animals are destitute of the sense of smell, or any other sense, whilst they are in full enjoyment of the others? They would find no difficulty in this phenomenon. The functions of each sense, I should be told, require a particular apparatus, and certain species may not possess one or the other of them. But, if they admitted one organ only, through whose medium all the senses executed their functions, the want of one or more, in any animal, would be inexplicable.

Now, let what I have said be applied to the faculties, whose manifestation depends on the brain. There is scarcely any species of animals, which does not enjoy certain faculties and qualities, not to be found in other species. The unwieldy beaver, and the nimble squirrel, are both admirable architects; the dog, the docile, intelligent, and unwearied companion of the sportsman, has no skill in building. The horse, fearless in fight,—the bull, so loving to his dames, so formidable to his rivals,—have not the blood-thirsty propensities of the weasel and falcon; the sparrow and the turtle-dove utter not the sweet notes of the nightingale. Sheep live in flocks; the rook, honey-bee and ant form communities; the fox, the eagle, and the magpie dislike the confinement imposed on them by the care of their young, to which they impatiently submit during some weeks only. The swallow, stork, fox, &c., are faithful in their attachment to a

single mate; the dog, so susceptible of affection, the stallion, the stag, gratify their desires with the first female of their species which they meet, &c.: and thus natural history, from beginning to end, exhibits to us, in each species of animals, different propensities, constructive instincts, and faculties. Ought not, then, the conclusion necessarily to follow, that the distinctive propensities and faculties of these animals are occasioned by different cerebral parts? If the brain were the single and universal organ of them all, each animal ought to possess them all indiscriminately. It would even be impossible, any longer, to conceive why man, aided by his organization, is raised by superior intellectual faculties, above all other animals, and forms a separate class. But, if it be supposed, that each fundamental faculty, like each particular sense, depends on a particular cerebral part, it is not only conceivable how any one animal may be destitute of a certain cerebral part possessed by another, but, also, how all animals generally may want certain encephalic parts; of which man is the sole possessor. In treating of the individual organs, I shall endeavor to prove, that this is actually the case in nature.

In the mean time, compare the brain and cranium of the monkey, (pl. xxxiv.) with those of man, (pl. viii.;) what a difference in the cerebral mass, in the height and convexity of the forehead! Let the brain and cranium of the carnivorous mammifera, and of birds, be compared with those of the frugivorous mammifera, and of birds. The carnivorous class have a voluminous and convex mass of brain, which, in most of the species, forms a prominence above the external auditory meatus. In the frugivora, this convexity of the cranium, and the cerebral portion corresponding to it, are totally wanting. This remark is sufficient to put the reader in the right path. Hereafter, I shall prove that the different animals, in which certain cerebral parts are wanting, are likewise deficient in all the fundamental faculties and qualities corresponding to these parts; whence the conclusion

necessarily follows, that the manifestation of each fundamental faculty or quality is dependent on some particular cerebral part.

Third Physiological Proof.

The qualities and faculties found in every individual of the same species, exist in very different degrees; a circumstance only to be explained by the different degree of activity of the various organs, through which these qualities or faculties are manifested.

Every one knows, that dogs, in general, possess the same qualities and faculties; and, likewise, that some particular quality or faculty may be met with, in very different degrees, not only in the different varieties of dogs, but also in different individuals of the same variety. The mastiff, bull-dog, beagle, stag-hound, water-dog, pug-dog, wolf-hound, and grey-hound, are distinguished from each other, not by their form only, but by also their individual character, though all have the character belonging to dogs in general.

Individuals of the same variety, likewise differ much from each other. No water-dog or pointer has exactly the same qualities and defects, as another water-dog or pointer. In the same litter may be found two pups, one of which exhibits from his very birth an extraordinary eagerness for hunting, which is confirmed at an after period by his extreme docility in the sportsman's hands, whilst the other cannot be broken in at all; the former being carried when very young to a considerable distance, finds his way back without difficulty; the latter loses himself in the very house in which he was littered. I knew a water-dog, which engaged in all the canine contests that took place, and sought every opportunity of making a fight; even punishment failed to correct him of this propensity. I, myself, owned a dog of the smallest species, which, although brought up by

a lady of very gentle disposition, would allow neither bird nor cat to be kept near him, he killed them all; for this reason he was given to me. I thought that, by severe punishment, I might break him of the habit; but chastisement was of no avail. *Not one of his pups exhibited the same passion* in a remarkable degree; many of them, indeed, had so little taste for the favorite amusement of their progenitor, as to permit small birds and mice to frolic unharmed within their reach. Some dogs have an extraordinary passion for stealing; others appear insensible to the most powerful propensity of their species, and look upon the female with the utmost indifference. In another place, I have quoted the story related by De Coste, the translator of Locke, of the dog which wished to obtain a warm place near the fire, and for this purpose set up a terrible howl; whilst the other dogs were running to the door, he settled himself to his satisfaction. This stratagem never failed of success with his comrades, less crafty than himself.

Who does not know that horses, oxen, asses, mules, and even sheep and goats, differ in individual character? I will merely mention here the cow of Dupont de Nemours; out of a whole herd, she was the only one able to raise with her horns the bars, which inclosed a field of wheat or maize.

He, who is an attentive observer of the habits of animals, will find the same differences in the most savage beasts. I have in my possession the cranium of a wolf; the whole litter, of which the animal in question was one, was taken from the dam, and brought up alike. All the others retained the ferocity of their character; but he was completely tamed, and felt for his master the attachment of a dog. Inquire of the keepers of lions, tigers, hyenas, &c., and any one may convince himself that a similar difference of character exists in the different individuals of all these species.

I have a hundred times brought up birds taken from the nest, and have uniformly noticed similar differences in their characters. One was very tame, and gave un-

interrupted attention to an air whistled in his presence ; another constantly remained wild and inattentive ; one loved the society of birds of any kind, and delighted in feeding their young ; another attacked with all the fury of envy and jealousy those which appeared to love each other. Some, when liberated from their cages and allowed to fly in the room, suffered themselves to be caught repeatedly ; others could not be induced, either by hunger or stratagem, to re-enter their prison.

Whence proceeds this dissimilarity among individuals in the faculties and qualities, essentially common to the species ? No question can arise here, as to the influence of education or other accidental causes ; for I have already refuted this objection in the section upon innate dispositions. Will these phenomena ever be explicable on the presumption of a single organ ?

But every difficulty vanishes, the moment it is conceded, that each particular faculty or quality has its especial organ. It can then be conceived, that one organ may be more completely developed in one individual, than in another of the same species, and for this reason, the quality or faculty, dependent on it, may be more strikingly manifested.

In a future part of this work, I shall compare the rounded forehead of the intelligent water-dog, with the flattened forehead of the indocile greyhound ; the broad cranium of the spirited sporting-dog, with the narrow, elongated head of a timid one ; the forehead of docile horses, prominent and broad above the eyes, with the narrow and retreating forehead of the indocile and vicious ; the brain and cranium of the male and female of those species, in which the two sexes are distinguished by greater or less development of certain qualities or faculties, as, for example, the brain and cranium of the bull and cow, the stud-horse and mare, the dog and bitch. As the passion of physical love is more energetic and lasting in the male, than in the female of these animals, the cerebral part, which determines the propensity, and the protuberance on the cranium corres-

ponding to it, are larger in the former than in the latter. In the female, on the contrary, the love of offspring has a preponderating activity ; the organ, likewise, corresponding to this quality, is more developed.

Let us by repeated observations endeavor to understand nature, and then we shall be soon convinced, that the cause of this gradation of qualities may be found in the proportionate gradation of development in the organs, which, although in essentials common to all, are not developed in all in the same degree.

All the differences observed among individuals, in the different species of animals, are manifested in a still more striking manner in the human species.

Have not many distinguished naturalists sought for an explanation of the difference of national characters in the different structure of the cranium ? Their inquiry related to the different degree of development of certain independent cerebral parts, which, whether it proceed from climate, or any other exterior cause, still does not alter the fact, that the general character of a nation corresponds to that form of the brain and cranium, which is most common among the individuals who compose it.

Whence proceeds the dissimilarity, in moral and intellectual character, of individuals of the same family ? the great difference between scholars in the same class, and under the same control and guidance ? the variety of propensities, talents, and behavior in the same class of the common people, whose education has this one point of resemblance, that, of the individuals who compose it, not one has ever received any, and, in which, uniformity of occupations and singleness of aim of all their toil, a livelihood, ought to produce uniformity, both in moral qualities and intellectual faculties ? Why does the shape of the cranium and brain of a man of vast and elevated mind, differ so singularly from that of the brain and cranium of men of narrow, grovelling minds, or from that of the feeble and imbecile ? Why does the head of a great mathematician differ, in its form, from that of a distinguished general, politician, or poet ?

None of these phenomena are explicable on the hypothesis, that a single and uniform cerebral mass occasions not only the different propensities and faculties, but likewise all the shades of the various degrees in which these propensities and faculties are manifested.

But, if it be granted, that each cerebral part has its distinct function, then the moral and intellectual character of individuals, as well in animals as in the human species, must necessarily be susceptible of as many adventitious modifications as the cerebral organs—on which the qualities and faculties depend—are susceptible of different relative proportions;—proportions, which result from their different degree of development.

Fourth Physiological Proof.

The primitive or fundamental qualities exist in the same individual, in very different degrees; now this would be impossible, if each primitive quality were not dependent on a particular organ.

To support this position, I again adduce the analogy of the external senses. Even though anatomists had not proved them to be distinct and isolated, still it would have been inferred from the very moment, in which one or more of them were observed to be feeble, and the remainder very strong, in the same animal or the same man.

If, then, the same phenomenon be true, with respect to the moral qualities and intellectual faculties, may it not be reasonably inferred, that their internal instruments are equally distinct and independent?

No animal, as, for example, no horse, no dog, can be found possessing, in the same degree, all the qualities and faculties peculiar to its species. One of my dogs is extremely surly: he fondles no one; but he has not the slightest taste for hunting, nor the least inclination to kill any animal whatever. Another, of which I have already spoken, has no enjoyment greater than that of killing; but, except when attacked, he lives peaceably

with other dogs. A bitch that possesses neither courage, disposition for hunting, nor instinct of locality, caresses every one indifferently, and exhibits extreme fondness for her pups. Every judge of horses remarks similar differences in these animals; and persons, who have an opportunity of making observations on monkeys, birds, &c., will find, that each individual manifests, in different degrees, the qualities and faculties characteristic of its species.

As the qualities and faculties of man are very numerous, the different degrees, in which they are possessed by the same individual, are likewise more perceptible. Some children are imbecile in many respects; but, notwithstanding, possess great cunning, a decided taste for drawing, music, &c. Let the reader recall to his mind my previous remarks on partial imbecility. Individuals possessing first-rate talents of a certain order, are, I repeat it, perfectly insignificant, sometimes, in every other way; who does not know mathematicians, musicians, mechanicians, and poets, to whom this remark is applicable? Extraordinary memory and a talent for satire are found in individuals, who lack judgment and *kindliness of feeling*. Courageous men are frequently rash.

These different degrees of the primitive dispositions are observable, not in particular qualities or faculties only, but often in entire and voluminous divisions of the brain also, so far that these latter have acquired, generally, a beneficial or injurious development, whilst other principal divisions of the encephalon are found to be atrophied. In the first volume, I laid down five fundamental divisions of the moral qualities and intellectual faculties, which, whether common to man and some species of animals, or exclusively peculiar to man; whether sentiments or faculties; whether belonging to a superior or an inferior class—correspond to cerebral parts of a primary order; so that we can seek, without apprehension of mistake, for the faculties and qualities

common to animals and man, in the posterior-inferior and middle-lateral parts of the brain, and for those exclusively peculiar to man, in the anterior-superior cerebral regions. Hence it follows, that, when the organs of the posterior-inferior region of the head are eminently developed, and those of the anterior-superior region are stinted, the animal propensities will have the preponderance. The contrary is the case, when the anterior-superior cerebral parts have acquired a high degree of development, whilst the posterior-inferior parts are deficient. When both are strongly developed, the dispositions corresponding to them are nearly in equilibrio.

If the whole brain were a single homogeneous mass, would not every individual necessarily possess every quality, and every faculty in the same degree? If the brain be a single organ, and if the organic condition of each of these manifestations be consequently the same, how could the innate dispositions of man and animals possibly differ? But, if distinct sections of the brain be appropriated to different trains of sentiments and ideas; if each different cerebral part correspond to a distinct faculty, then every modification of character depends on the different degree of development attained by certain sections or particular parts of the brain, and their different degree of activity.

Objection.

"The modifications of the same faculty, it is said by Bérard and de Montégre, are infinite: will, therefore, such a number of organs be necessary? and, if certain shades of character are produced by slight modifications of the same organ, why may not all be explained in a similar manner? There is no alternative; the cases are identical.

" You believe that the difference of organs accounts

for the difference of minds ; but, if each man has a mind peculiar to himself, where shall we stop ?”*

Reply.

We must admit as many modifications of the same organs, as there are distinct modifications in its functions. Though there is a notable difference in the song of birds of different species, and in the melodies and harmonies composed by different authors, yet the varied song, melodies and harmonies owe their existence to organs of the same kind. But, because these different melodies and harmonies are produced by the same organ variously modified, it is by no means an allowable conclusion, that the instinct of perpetuating one's species, the love of young, the constructive instincts, the instinct which impels animals to form societies, are to be considered as simple modifications of the function of one and the same organ.

Bérard and de Montégré, on the principle of this same objection, would like to explain the different instincts of animals by *a general law of sensibility* : yet, in the same paragraph, they declare the impossibility of explaining instincts, because they are founded upon *a general law of sensibility* !

I believe that it is, in general, injudicious to undertake the explanation of any natural power whatever ; but it is certain, that an instinct, no matter what the instinct be, can proceed only from an organ's activity ; in other words, the moment an organ of any power becomes active, that moment the animal or man becomes conscious of its activity ; the animal or man feels an impulse to sexual congress, an inclination to foster its young, to construct a habitation, to sing, or to travel.

* Dictionnaire des Sciences médicales, art. *Cranioscopie*, T. vii. p. 308.

But it follows, thence, that there must be as many organs as there are instincts, essentially distinct. I refer the reader back to the second proof derived from physiology.

Bérard and de Montégre adduce the numerous relations between the stomach and food ; but this proof is restricted to one function, digestion, which always remains the same. Similar modifications occur in all organs and their functions; the same music does not appear good to all musicians; the same woman does not please every man ; the same odor is not agreeable to all ; but, until these physiologists are able to make the stomach at once an organ of circulation, of secretion of bile, &c., they will be unable to make a single organ the instrument of the most dissimilar functions of animal life.*

Fifth Physiological Proof.

Those functions of the brain which are essentially different, are not simultaneous in their appearance, either in animals, or in man ; some are constantly manifest, others appear or vanish, according to the age of the individual, or from the influence of season. Now, these phenomena could not occur, if all the functions proceeded from a single homogeneous organ.

Here, again, nature pursues an uniform course through the whole range of organized beings. In plants, parts are successively developed at different periods, as the end, that is to be obtained, changes ; many years sometimes intervene between these different periods. Numerous insects, and amphibia pass through various transformations, before arriving at perfection,

* This objection was again brought forward in the *Revue Médicale*, v. vii. p. 342, March, 1822—and the same reply was made.

before the organs, needed in their perfect state, attain full development.

Even in the more perfect animals, the organs of nutrition, secretion, excretion, circulation, &c. are developed at different periods, according to the species; some parts, immediately after birth, undergo changes that divest them of the capacity to execute their primitive functions.

The case is precisely the same with the different nervous systems. At first, those of vegetative life are the most fully developed, and the most active. Then follows the spinal marrow, whose different pairs of nerves are developed, and become active at periods quite distinct and remote from each other.

The nerves of sense also are subject to the same law. Those of taste, and smell are ordinarily first developed; the acoustic and optic nerves not till afterwards, both in animals which are born deaf and blind, and in children.*

In most animals the instincts, whose seat I shall at a future period demonstrate to be the brain, are subject to the control of the seasons. The instincts of singing, of coupling, of building, of providing for the future, &c. are sometimes in a state of activity, and sometimes in a state of absolute repose. Some animals, on being carried from their native climate, kept in captivity, and compelled to feed on nutriment different from that of their natural state, either exhibit no indication of certain propensities, or manifest them more strikingly; whilst other propensities of the same individuals experience no change whatever.

What does our observation of man teach, relative to the successive development of different cerebral parts, and the manifestation of the faculties, which is successive also, and at the same rate of progression.

* The gray substance in which the nervous fibres originate, (for this reason I denominate it the *matrix of the nerves*,) is much more abundant at the period of vegetative life, than when the nervous systems are in the full performance of all their functions.

In the new-born infant, the gelatinous substance (the cortical gray substance) is in much greater quantity than the whole nervous matter; the entire brain presents the aspect of a reddish, dirty white pulp. The nervous fibrils are first visible in the posterior and middle lobes, and only at a later period, in the anterior lobes. The superior-anterior cerebral parts placed against the forehead, are not developed till after the lapse of some months, when the infant is going to receive, retain and apply impressions from the external world. In infancy and adolescence, the cerebellum, compared with the hemispheres, is much smaller than at the age of virility, when it is capable of perfectly executing its functions. From the epoch of which I have just spoken, till the age of forty or thereabouts, each cerebral part acquires the degree of development of which it is capable. Then the brain having remained stationary during ten or twenty years, begins to decline and lose its fulness and turgescence, and in the same proportion its activity. But all the cerebral parts do not waste at the same rate. The anterior-inferior parts diminish sooner than the others; hence the faculties dependent on them, among others the memory of names, are first to fail. Successively, every cerebral part is more or less impaired; the power of combining a great number of ideas, of grasping the relations of objects, and the chain of cause and effect, is lost; new impressions slip, as it were, through the exhausted brain; and the old man, who can no longer recall the events of the preceding evening, delights in the prolix and oft-repeated recital of his youth's adventures; decay creeps on, till finally nought remains but a few inert cerebral fibres, and insensibility and dotage.*

* "There is a very interesting fact, which has never attracted the attention of any anatomist," says M. Richerand, in his Elements of Physiology, 7th ed. vol. ii. p. 127, "which is, that the brain of the foetus and of the newly born infant appears to consist almost entirely of a grayish pulp, so much so, that the medullary substance is scarcely perceptible. Would

This development of different cerebral parts at different times, is particularly visible in those individuals who form exceptions to the general rule, in whom certain faculties are developed much earlier, or much later than usual, whilst all the others appear in the order of succession. In treating of the primitive powers and of their organs, I shall give many instances of this kind; some I have already narrated in the section upon innate disposition.* The most striking circumstance of all is, I repeat it, that *prodigies*, in every thing but the talent which particularly distinguishes them, are just as childish as other children.

Were the brain merely a single organ, could all the phenomena of which I have just spoken, be satisfactorily explained? But on the other hand, they may easily be accounted for, the moment the organs are admitted to be plural. On this last supposition, there is no difficulty in conceiving, how the different cerebral parts are confined to a certain order of succession, both in their development and their diminution, nor how one organ may sometimes deviate from the common course, and, in its development, either outstrip or linger behind the others.

I have had opportunities of observing many children, some precocious, others backward. Two were boys, one of three, the other of five years of age; both were

it be an absurdity to suppose, that the medullary portion of the brain does not acquire its complete organization till after birth, by the development of the fascies of medullary fibres in the midst of the grayish mass which should be regarded as the common source, as the *matrix*, to make use of a term employed by Dr. Gall, in which they originate? The state of the fetal brain being one of almost absolute inactivity, and in a manner passive, the existence of the medullary apparatus—to which the most important operations of the intellect are confided—is unnecessary: its rudiments, however, are found in the fetus arrived at its full term."

I pray the reader to compare with the preceding passage, my remarks upon this same subject, which may be found in the first volume of my large work, published in 1809, in order to judge whether Richerand has any claim upon the observation.

* See a great number of similar instances in *learned children*.

able to execute perfectly the sexual function. I found the cerebellum, the organ of physical love, completely developed in them, whilst the remainder of the brain had no more development than is usual at these ages. In the young American Colburn, distinguished by his precocious talent for calculation, and in two other boys who presented a similar anomaly, I likewise found the organ of the predominating faculty remarkably developed. Spurzheim has confirmed my experience by an observation made by himself on a young girl whom he saw in London : the remark indeed is applicable to all precocious children. The reverse is observable in those who are backward in any one faculty. It is my custom, when lecturing, to support, at the time, my sentiments, by presenting to my audience, either living subjects or casts.

Objection.

It is thought by Rudolphi, that the development of the faculties and qualities, at different periods, may be explained otherwise than by a coincidence of time between their appearance and the development of their organs. "The child," he says, "commences by receiving impressions ; but he does not begin to compare and judge, before he has seen much, or read much ; judgment, therefore, will be posterior to impressions, for it supposes acquisition of knowledge. It is thus with all the powers of the mind ; they cannot be developed, until the necessary conditions of their existence are fulfilled."

Reply.

It is necessary, undoubtedly, to have experienced many sentiments, to have acquired many ideas, before being enabled to draw comparisons, or form opinions. But neither experience, nor any number whatever of

sentiments and ideas can invest man with the power of comparing, and forming opinions upon them. According to the ground assumed by Rudolphi, each intellectual faculty, as to the perfectness of its manifestation, must be in the ratio of the abundance of external materials. Thus the soldier, who has been present at the greatest number of battles, would make the best general ; the literary man, who has studied rhetoric and the art of poetry the most carefully, and perused with the most diligence the works of orators and poets, would be the greatest orator and the best poet. The common people would rightly estimate, as an excellent physician, the ward attendant, who has passed his life in hospitals. We should have attained the art of forming, at will, great men in all professions.

Experience, however, disproves this supposition. Present to a child a thousand facts ; he will, perhaps, readily understand them, and not forget even one ; but will he, therefore, weigh them with the deliberate judgment of a man ? Where are the great orators, and the sublime poets, who have been formed solely by the study of the principles of their art ? Why do the intellectual faculties deteriorate in old age, although experience and the accumulation of subjects of comparison have been steadily on the increase.

Aided by external and internal instruments, animated beings are capable of receiving and reacting upon impressions from without ; external objects are so far valuable, as being the source whence these impressions are derived ; otherwise, they are useless ; for, let a monkey live during ages in the midst of men, and he will still remain a monkey. Present facts to an imbecile, instruct him in the rules of the arts and sciences, assemble around him the best models ; and, after all, it is labor wasted. The charms of Venus' self would fail to stir the passions of the beardless boy.

But, when the senses are perfect at birth, they need, for the manifestation of their functions, neither experience nor practice. The spider spins its web the

moment it bursts the shell; and scarcely has the butterfly spread its wings to the breeze, before it extracts nectar from the flowers, and feels the imperious necessity of sexual union. The first cause then of an organ's action is, not the accidental influence of external objects, but the activity of the organ itself. Now, as the different organs do not all acquire their final development at the same period, in conformity to laws whose authority is eternal, the manifestation of their functions will commence, diminish, and terminate, at different epochs and periods, from which the inference necessarily arises of the plurality of the organs.

Sixth Physiological Proof.

Long-continued mental application does not fatigue all the intellectual faculties in an equal degree. The principal exhaustion is always partial, insomuch that rest may be obtained simply by changing the object of occupation. This would be an impossibility, if the whole brain were engaged in each exertion of the mental powers.

When wearied by standing still for a long time, walking is a relaxation; and, if the body be fatigued by continuance in any position whatever, a simple change to another brings relief. Satiated with the enjoyments of the banquet, we listen with pleasure to the charms of music. Now, if there were but a single instrument for the different functions of sense, the fatigues and satiety would be general; and one function could not by any possibility continue active, whilst others were inactive.

The same phenomena, precisely, are observable in the manifestation of the mental faculties. Thus, when too long sustained attention to the same subject has occasioned exhaustion, we recreate ourselves by a change of subject simply, the intensity of the mental exertion remaining the same; and there is no student who is not aware, that, by an occasional change of object, he

can continue his mental labors for a much longer time, than by confining himself steadily to the same object. Hence I conclude with Bonnet, "that, if fatigue ceases when the object of the mind's employment changes, the reason is, that other fibres (other organs) are called into action."

Objection.

Ackermann contends, that we obtain repose simply by passing from one occupation, which demands a certain degree of mental application, to another which needs less.

Reply.

I play various games at cards with much ease; but as I have little fondness for the amusement, it soon wearies me, and even brings on headache. If, in this state, I leave the card-table, and apply myself to some serious pursuit, which requires mental exertion, my fatigue goes off in the course of a few minutes. Who has not felt the irksomeness of the frivolities of certain circles of society, and the happiness, on escaping thence, of being able to occupy the mind with more important objects? It is an every-day fact, moreover, that, when fatigued by employment in our habitual occupations, we find repose or refreshment, by listening to music that touches our sensibilities, by gaming high, or by witnessing the representation of a highly wrought tragedy? In this case, the feeling of repose, experienced on a change of employment, cannot be attributed to a less degree of mental exertion.

Objection.

If this activity and repose, says Winckelmann, were alternate, there could be no such thing as absolute

fatigue; we should be able to toil without a moment's interruption.

Reply.

Neither in animals, nor in man, are all the instruments of voluntary motion, or of the senses, ever found simultaneously active; consequently, according to Winckelmann, neither animal, nor man, would ever need the restorative balm of sleep to dispel the fatigue of all these instruments. As Winckelmann, then, is entirely wrong, relative to the instruments of the senses and voluntary motion, it is not going too far to affirm, that his conclusion, as applied to the different organs of the intellectual faculties, is likewise erroneous.

Objection.

Rudolphi, Winckelmann, and Dumas think that the pretended state of alternate activity and repose of different cerebral parts, may be explained by the different manner in which the brain is affected by each idea and sentiment. It is so, they say, with other organs of the body: the same attitude soon becomes fatiguing; the same motion quickly exhausts; the slightest change brings ease, and absolute repose is followed by perfect relief; walking is grateful to one who is wearied by riding on horseback.

Reply.

The preceding examples justify my assertion; in every change of attitude, in every different motion, different muscles are brought into action. The physiologists, certainly, do not think that the same muscles are in action, when we are walking, as when riding on

horseback ; they have, therefore, advanced nothing which favors the assertion, that the same part, the same organ, is always affected, its mode only of affection being different.

In proceeding to the proofs derived from pathology, I shall more fully develop this last physiological proof.

PATHOLOGICAL PROOFS.

Further development of the sixth physiological, and first pathological proof.

The origin and method of cure of certain mental diseases, equally prove a plurality of the mental organs.

The organs of the moral qualities and intellectual faculties are, in certain respects, subject to the same derangements as other organs of the body. When a muscle, limb, the eye, ear, &c., are for a long time kept upon the stretch, their excitability is augmented ; hence, spasms, convulsions, trembling ; and these irregular movements are altogether beyond control by the will : we continue to see the spectres of the colors, which shortly before had attracted our notice, and to hear the delicious music, which has ceased to sound.

In the same manner, the sentiments and ideas which have engrossed our whole being, still continue to interest, though the objects which gave them birth, no longer immediately affect us. If we persist, and make an unreserved surrender of ourselves to these favorite sentiments and ideas, it becomes more and more difficult to emancipate ourselves from their control ; for the organs, in activity, have acquired such a degree of excitability, as to become incapacitated for regular, voluntary action. It is in this manner, that a man is enslaved by a certain train of ideas or sentiments.

We here see the most frequent origin of partial mania,

(*monomania.*) If the brain be but a single organ, and an homogeneous mass, the whole of which acts on the manifestation of each of the moral qualities and intellectual faculties, I do not see the reason, why the mania, in these cases, is not general rather than partial ; and yet most frequently it is partial, and, in its nature, analogous to that of the excited function.

What do the means, by which we are enabled to prevent or cure partial mania of this kind, prove ?

The instant in which physicians find an individual threatened by partial mania, from the above-mentioned causes, he advises him to give up his accustomed occupations, to divert his mind, to travel, and to interest his feelings in a new employment. By this course of conduct, the organs, which are highly irritated, have an opportunity of recovering themselves, whilst other organs are executing their functions with increased activity. I have, at various times, repeated the experiment in my own person. In youth I was a somnambulist, and frequently saw visions, a certain proof of cerebral exaltation. At a later period, I became passionately attached to a certain course of study, but I soon perceived that the subjects on which I was occupied, turned my ideas exclusively in a certain direction ; I was harassed by wakefulness, in spite of my fruitless efforts to get to sleep ; although my eyes were closed, I still saw around me a light like that of mid-day. To extricate myself from this disagreeable state, I felt it necessary not to confine my attention so exclusively to the objects which interested me. I created another favorite occupation, became passionately fond of gardening, and soon succeeded in re-establishing the equilibrium of my intellectual powers. Even to the present time, I feel it imperatively necessary to vary my occupations, either to prevent the return of a similar state, or to retain that mental equality which is essential to my labors.

When the exaltation of an organ has reached a point at which its action is involuntary, all advice bestowed upon the patient is useless. It becomes the duty, then,

of his physicians and relatives, to transfer him into a new world of sentiments and ideas ; and to excite the activity of organs which have hitherto remained almost entirely quiescent ; to awaken new passions, to encourage a decided taste for occupations to which he has, as yet, been an entire stranger, and, by this means, enable the too highly irritated and enfeebled organs to recover their natural tone, and resume their healthful regularity of action.

A man of rank became insane ; his mind had been intensely occupied on a single subject, for too great a length of time ; he was cured by the removal of the object of his accustomed attention, and by amusements. Still he thought himself in danger of a relapse, and he assured me, that he had prevented it only by diversity of occupation.

A lady, fifty years of age, naturally of a thin habit, serious even to melancholy, and possessing from infancy a disposition of great unevenness, was deeply devoted to religion, and followed all its precepts literally. She became indifferent to her own affairs, and was constantly perusing devotional works, the sense of which she strangely misinterpreted. The confusion of her ideas continued to increase, and her thoughts constantly dwelling on eternal damnation, she believed herself irrevocably consigned to the flames of hell, although her moral conduct had always been exemplary. Nothing could withdraw her mind from the idea, and hope was annihilated in her heart. Her room was hung with pictures, that reminded her of the object of her melancholy ; she saw no visitors but the ministers of religion, whose attempts to dispel her fears were perfectly fruitless. Whilst in this state, her books of devotion were taken from her, the pictures removed, and the visits interdicted ; no argument, no conversation on religion was permitted ; the greatest regularity was observed in her hours of rising, retiring, and eating ; and she was induced to walk abroad every day, sometimes even to fatigue. At the end of some days there was a gratifying

improvement, and her mind could be occasionally withdrawn from the thought that engrossed it. A light diet, every possible means of diverting and interesting her, constant exercise, attention to overcome by uninterrupted occupation her natural propensity to indolence, and the repeated administration of mild laxatives to counteract habitual constipation, produced the desired effect: in a few weeks she was restored to perfect health.*

A rich merchant met with a loss, that might have been easily repaired, but his imagination was so powerfully affected by it, that he thought himself ruined. This happened about the period, when the disturbances, occasioned by the reformed religion, took place in Germany. The maniac embraced the cause of Romanism with extreme zeal; labored night and day, and his efforts by haranguing and writing, to defend the celebration of mass, were so excessive, that eventually he was cured of his melancholy.†

"It is observed in the Hospices, (houses of religion)," says Pinel, "that those insane females who have learnt to sew in their youth, easily resume the practice on the decline of their disease, and can give their attention to those sedentary occupations, which only disgust the peasant women accustomed to hard work in the fields; the latter, therefore, remain apathetic and inactive, and either advance slowly towards convalescence, or remain incurable. Again, what numerous obstacles oppose the recovery of the rich, whose lives, from youth upwards, have been spent in the most frivolous pursuits, and whose minds are incapacitated for the culture of the fine arts, or the study of the physical sciences!"‡

The great point, therefore, always is, to divert the attention of the patient from the object of his insanity, by fixing it upon other objects.

* An analysis of Insanity and its means of cure, by L. V. F. Amard.

† Ibidem, p. 72, Lyons, 1807, p. 70.

‡ On mental alienation, p. 83 and 84.

It is manifest, that, in all the cases referred to, the cure was entirely owing to bringing into activity certain cerebral parts, and giving repose to others, which were previously too much excited. Numerous instances, and, in particular, that of the merchant just quoted, prove that diminution in the degree of mental application is not the principal point, when we wish to recover the mind from excessive fatigue, or to cure it when morbidly-irritated. Oftentimes, the rapidity of the cure is in proportion to the vividness of the impression created by another idea or sentiment: a certain proof, that the sole requisite here is alternate action of the cerebral parts, which are the organs of different moral and intellectual powers.

Second Pathological Proof.

Some of the moral qualities or intellectual faculties, in consequence of disease, stimulation, injury, &c. may be disordered, impaired, or exalted, whilst other mental functions are in an entirely different state, or indeed perfectly healthy; a phenomenon which it is impossible to conceive of, on the hypothesis, that the entire brain is but a single and homogeneous organ, by which all the qualities and faculties are manifested.

If there existed a single instrument only, of voluntary motions, one organ only for all the functions of the senses, both motions and functions must necessarily experience at the same time similar derangements. In like manner, all the moral qualities and intellectual faculties would be disturbed, at the same time, if their manifestation were dependent on a single organ. But what does experience teach us in this respect? A man being about to seat himself, the chair was withdrawn from under him. The shock of his fall deprived him completely of the memory of names. A distinguished surgeon at Paris suffered in the same way from a ner-

vous fever. Broussonnet, by a fall, lost the memory of nouns.

The gradual diminution of the faculties, produced by age, is also confirmatory of the successive loss of the faculties. This circumstance is the more striking, because we occasionally see certain faculties retaining all their energy even in advanced age, whilst, as respects others, their possessor is in complete dotage. The famous Sagney, when lying on his death-bed, incapable of recognizing any one, was asked by Maupertuis, "what is the square of twelve?" "One hundred and forty-four," was the unhesitating answer. An octogenarian of my acquaintance, who had always been characterized by a very satirical turn of mind, has now lost his memory entirely, and has become absolutely demented; yet occasional sarcasms still indicate his natural talent. Who does not know of similar instances in the biographies of many distinguished men? And it will be remarked, in every case, that those qualities or faculties which were the most prominent in the vigor of life, are precisely those which retain most energy in its decrepitude.

There is no case more common, than for a quality or faculty to be developed in consequence of a wound, or poisoning, or an inflammatory fever, at a degree never manifested in health. I have quoted, in another place, the case of a boy, who, having received a wound on the side of his head, was completely mastered by an incorrigible propensity to steal. I knew a young physician, who had contracted the unfortunate habit of intemperance, and who, whenever he was intoxicated, improvised Latin speeches, as remarkable for refinement of thought as elegance of diction. A dress-maker, in access of fever began to make verses, though in health she had never thought of such a thing.* A lady, who rarely sung, having become maniacal after childbirth, sang uninter-

* Van Swieten.

ruptedly for many days. Tasso composed his finest lines during his accesses of mania; and Pinel quotes from M. Perfect, the case of a young female, of very delicate constitution, and subject to nervous affections, who became insane: during the continuance of her disease, she composed with facility, in English, very sweet verses, although she had never previously shown any fondness for poetry.* "In another case of insanity those ideas and sentiments which are connected with the feeling of pride had acquired an extraordinary exaltation: during the accesses, the patient thought himself the prophet Mahomet; he then assumed the attitude of command, and the tone of the Almighty; his features glowed, and his step was replete with majesty, &c."† "Many, who in health, or during their lucid intervals, are examples of the strictest uprightness, cannot, whilst the paroxysms continue, restrain their inclination to steal and cheat."‡ "A man, whose natural character is peaceable and mild, seems, during the access, to be urged on by the very demon of mischief, &c."§

Every one is acquainted with the species of alienation, in which the patients are deranged on one point only, and rational in every other respect. A few examples of this kind will be sufficient.

An officer, whose ambition had never been gratified, imagined himself a general; placing himself in an attitude of command, he conversed with me very sensibly on many scientific subjects, and, the stiffness of his carriage excepted, I noticed not the slightest deviation. Pinel has related many similar facts. I once saw a female, the turn of whose mind was naturally devout, who thought herself possessed. On every other subject she

* Pinel on mental alienation, pp. 112 and 125.

† Ibidem, 111, § 124.

‡ Ibidem, p. 125, § 132.

§ Ibidem, p. 101, § 116.

exhibited extraordinary quickness of apprehension, insomuch that it was difficult for myself and companions to maintain our ground against her sophisms. I attended a very learned, and apparently very rational ecclesiastic, who asserted, that he was damned past forgiveness. A rich man, having been compelled to devote some time to a very complicated business, became melancholy. During the accesses, he saw, in every event, a misfortune and calamity : he lamented and wept like a woman : in his agitation he traversed his spacious chamber, one moment determined to end his life by suicide, and the next abandoning the design. If, at this very instant, a subject of conversation were introduced, no ways connected with his wealth, a veil appeared to drop suddenly from his understanding ; he conversed most charmingly, and the acuteness of his remarks astonished all present. A teacher of languages got an idea into his head, that the police were every where in pursuit of him, insomuch that he sometimes endeavored to throw himself out of a window, yet, during all the time, he had never ceased to teach the English language with the greatest success.

This species of mania is so common, that it has been denominated *reasoning mania*, because those who are affected by it, perceive and combine their ideas exactly like rational persons, except on one or two points, where their ideas are positively deranged.

Cases are very frequently observed, in which, according to the expression of Pinel, and other writers, the *affective qualities* are especially disturbed, whilst the *intellectual faculties* remain unaffected. In the first volume, I mentioned the case of a man, who felt himself, from time to time, violently impelled to commit homicide, but who always retained sufficient presence of mind, during his paroxysms, to place himself under the superintendence of his friends. I have also narrated the case of a soldier, who was subject to similar paroxysms of blood-thirsty fury, and who caused him-

self to be chained on the approach of each access. Pinel has recorded similar facts,* and I have myself related an analogous case of frenzy, in which the intellectual faculties did not undergo the slightest alteration.

Even in congenital idiocy, all the moral qualities and intellectual faculties are not paralyzed to the same extent. In the majority of cases, as I have many times remarked, some of the faculties still enjoy a considerable degree of activity. I saw at Paris two idiot girls, who understood very well the songs which they heard, and, after a long interval, sang them very correctly, and repeated them as often as desired. The wild man of Aveyron, so called, placed in the institution of the deaf and dumb at Paris, exhibits a love of order which rises even to a passion, although all his faculties are extremely limited. If the most trifling article, a brush, for instance, be displaced, he immediately runs and replaces it. Pinel relates a very similar case. Sometimes, idiots, who, in every other respect, are excessively stupid and apathetic, have an irresistible inclination to physical love; others are unable to restrain their propensity to steal; others again, as I have already observed, are dangerous, from a sort of fury, which impels them to murder, to set fire to buildings, &c.

An explanation of these facts, I consider as impossible, unless a plurality of the cerebral organs be admitted. But, whilst the antiquity of prejudices invests them, in the eyes of some, with an holiness, that sets at defiance the most evident truths; others are satisfied by sophisms, which prescription has consecrated, and find the task of tracking nature into the recesses of her sanctuary, too difficult. My readers, therefore, will not be astonished that the plurality of the organs is the point, which has been most vigorously assaulted by those, who are inimical to the physiology of the brain. But, as this is a subject of the deepest interest to the philosophical physician, and

* On mental alienation, p. 102, § 1117.

as the objections brought forward may give rise to investigations of the utmost importance, I shall examine it with particular attention, both in a medical and philosophical point of view.

Objection.

According to Rudolphi, there is no particular cerebral part known, whose lesion or destruction occasions the loss of the mental faculties, so called. "Every kind of injury, every degree of compression of any part of the brain, whatever, occasions this loss." Neither, according to him, is there any known cerebral part, which can be regarded, exclusively, as the point of union of all the nerves. "If," he continues, "there were many special organs in action in the brain, how could the slightest lesion possible suspend or destroy, at once, all the powers of the *sensorium*? If these organs be independent of each other, as Gall is compelled to admit, it is difficult to conceive of complete insanity, an absolute cessation of consciousness, &c."

Reply.

On the hypothesis of a single organ, I would entreat Rudolphi to explain to me, how certain faculties can exist in an isolated manner, and how they can be destroyed without involving others; how can they be deranged alone, the remainder being unaffected? It is, precisely, because there is no part, whose lesion or privation necessarily involves the lesion or privation of all the qualities and faculties; because there is no point of union for all the nerves, that the existence of a single organ of the mind, a common seat of all the qualities and faculties, is an impossibility. If all the integral parts of the brain composed but a single organ, all the qualities and faculties would be disturbed in the same manner, and at the same

instant of time, in which one of the component parts was injured.

I have already stated, in what manner we should judge of lesions of the brain, and of the independence of the organs.

If Rudolphi cannot form an idea of total alienation, on the supposition of the plurality and duality of the organs, how can he understand a general disease of the body, with its plurality of viscera, and multitude of constituent parts? If he cannot imagine how a slight lesion can at once suspend or destroy all the powers of the *sensorium*, he will be still less able to comprehend how an inconsiderable lesion, or compression of a cerebral part, sometimes suspends or annihilates the manifestation of the functions of the five senses, each of which has its distinct and independent instrument.

Objection.

"Experience proves," says Dumas, "that an individual may possess, at one moment, a quality or faculty, of which he might be deprived the next; and that diseases, no ways connected with the brain, sometimes destroy, and sometimes bring its faculties into activity. Hence, it follows, that it is impossible to attribute the exercise of the faculties to a development of the cerebral organs, their pretended seat; for, in this case, it would be necessary to maintain, that they experience the same changes as the faculties; that their form varies, from time to time; that they are developed and obliterated; that they are present and absent. Although this is the inference from the facts enunciated, it by no means harmonizes with the delicate structure of these organs."

Reply.

Since a single quality or faculty may be lost and regained, without being followed by privation or recovery of

other qualities or faculties; since certain qualities or faculties may be debilitated or exalted by disease of other than cerebral parts, but whose influence, nevertheless, on the brain, is undoubtedly ; the conclusion necessarily and strictly follows, precisely from these circumstances, that each particular quality or faculty is dependent on a particular organ. It is quite an original idea, that these organs disappear when their functions cease, and reappear when the functions resume their activity. Do the instruments of the senses, the organs of voluntary motion, and the whole brain disappear, during sleep or a swoon, when all their functions are suspended? Does the eye vanish during the temporary blindness occasioned by worms? There is no doubt, that changes are going on in the organs, when the activity of their functions is diminished by disease, at the epoch of the climacteric years, by the variation of the seasons, and some external influences : I have, elsewhere, demonstrated this to be the case ; yet it is no evidence against their plurality.

Objection.

"If," says Bérard and Montégre,* "we pursue the reasoning of Gall into all its consequences, the multiplication of organs will be infinite, because the ideas of the insane are so. Did Malebranche, who saw a shoulder of mutton hanging from his nose, and who, in other respects, possessed a superior understanding, have an organ corresponding to this idea ? Do those who believe themselves changed into worms, or an animal, have special organs for these ideas ?

"Partial mania is frequently occasioned by a moral idea assuming a morbid fixedness, and is cured by interesting the mind in such ideas as may antagonize its influ-

* Dictionnaire des Sciences Médicales, T. vii. pp. 310 and 311.

ence : now, this fact, which is so common, by no means harmonizes with the theory of different organs. Finally, there are facts, which demonstrate its unsoundness. Each sense is subject to a particular kind of hallucination, to partial mania : will any one say, that there are different organs of sense in a single one ? In pica, the stomach is affected by particular cravings, by partially insane ideas, (if we may so express ourselves :) shall we, therefore, admit the organ of taste to have one organ for fruit, another for animal or vegetable substances, and their innumerable subdivisions ? When a woman in childbed, or other peculiar states, ardently craves green apples or pears, shall we allow an organ of taste for each of these objects ? Did the female, who was possessed by the singular desire of biting a morsel out of her neighbor's shoulder, have an analogous deranged organ ? The consideration of all these facts combined, is sufficient, we think, to show that their anomalous character is to be referred, not to a difference in the organs, but to an essential law of the sensibility which can assume a thousand different forms in the same organ."

Reply.

All the truth contained in this objection is entirely in favor of the plurality of the organs. Bérard and Montégre compare the functions of the senses to those of the brain. *All the senses, they say, are subject to particular kinds of hallucination, and to partial mania ; they speak of the peculiar tastes, and partially insane ideas of a diseased stomach, and of the longings of pregnant women.* They allow, at the same time, that *these varieties in the functions of the senses are infinite* ; but they do by no means draw the conclusion therefrom, that the instruments of these senses ought, therefore, to be innumerable also. By what right, then, do they impute to my doctrine the forced deduction, that the *organs of the brain will be as innumerable as the varieties of*

mania? If they perceive no difficulty in referring to five principal sources the numberless illusions and exhaustless variety of the functions of the senses, why should they see any insuperable obstacle in the innumerable varieties of mania, or the functions of the mental organs?

It is, in fact, with the mental organs, as with all the other integral parts of our organization. The deviations from a normal state are infinite. The eye sees objects double, or half only, inverted, misty, pierced in the middle, misplaced; all these innumerable and anomalous varieties of vision are the result of functional lesions of one and the same organ. In like manner, all the deviations from the regular function of a mental organ are owing to the same number of modifications in the organ itself. Do not ostentation, devotion, and sensuality, assume a thousand different forms, even in health? In what a variety of garbs, then, may we not expect disease to invest them? It would require folios to contain a description of all the diversities of a single species of mania; as, for instance, that species of which pride constitutes the source and essence.

Mania is often of a mixed character; that is to say, it results from an injury to the functions of one or more fundamental qualities or faculties. When pride and love, pride and devotion, pride and a propensity to destroy, act in combination, its forms will be more varied than when either of these qualities acts singly.

Finally; what a state of confusion, will there not prevail in that species of mania, which springs from general derangement of all the cerebral organs?

It would not always be so difficult to find a key to the fantastic ideas, the reveries and ravings of the insane, if we knew how they had been educated, the events by which they had been influenced, their impressions from accidental, external objects, their sensations and peculiar modes of association, the channel in which their ideas loved best to run, their predominating moral and intellectual character, &c. A female peasant will never

have a longing for pine-apples; neither will any one, who has never seen a camel-leopard, imagine himself transformed into such an animal. But the fevered patient, who feels the compression of his bandages, dreams of brigands and murderers, who are binding him with chains; he hears a buzzing, and strange voices ring in his ears. Does a soldier suffer from inflammation in the vicinity of the optic nerves; he sees the cannonier, with a lighted match in his hand, standing at his gun; the abscess bursts, and it is the explosion which follows. Does a hunter, in a severe attack of fever, feel pain in his intestines; he hears the howlings of wolves preying upon his entrails. Does a nervous and superstitious female labor under periodical stricture in the throat; it is the devil endeavoring to wring her neck. The tragedian Kruys, of Amsterdam, in his paroxysms of mania, believes himself the most atrocious of miscreants, and, foaming with fury, beats his head incessantly with his fist.

Thus, then, every thing may become the subject of mania; for, it is incorrect to maintain, with Esquirol, that illusions of the senses are the most frequent cause of mental alienation or insanity. These illusions, in fact, are never the subject of mania, unless the internal organs are diseased; so long as the internal man, that is to say, the brain, is sound, all illusions of the senses are recognized by it to be such; a buzzing in the ears is only a buzzing; a convulsive stricture of the throat is nothing more than a convulsive stricture, until some derangement of the internal organs transforms them into strange voices and devil's claws.* Since, then, accidental, exterior objects do not constitute the essence of mania, it is a waste of time to draw up descriptions,

* "Aconite and the extract of hemp," says Cabanis in his 'Relations between the physical and moral constitution of man,' Ed. 2d, vol. ii. p. 442, "can totally pervert the sensations of sight and touch, and yet leave the judgment sufficiently unaffected to appreciate this extraordinary effect, and refer it to its true cause."

minutely detailed, of its most singular and extravagant varieties, and to allow the classification of the disease to be influenced by these elaborate minutiae. The true physician penetrates more deeply into its real nature, and establishes its differences on characteristics, which are permanent and unchangeable.

Pinel has already censured those writers, who fondly indulge in descriptions of the frequent laughable extravagances of the insane, and who present a picture fully as confused and irregular as the Hospice itself would be in description. Having acquired a knowledge of the symptoms peculiar to mania, there will be no difficulty in embracing all its varieties in a very limited number of classes. Let the principle, on which the classification is based, be fundamental lesions of the faculties and propensities, paying but secondary attention to the varieties; since, although a countless multitude, they may actually be arranged under a very small number of species.

Hence, the doctrine, which teaches the plurality of the organs, does not authorize the deduction—that numberless varieties of mania require numberless sources of alienation, or, which amounts to the same thing, numberless cerebral organs,—any more than the observations of the most distinguished physicians. But does this justify Bérard and de Montégre in referring all the fundamental species of alienation to a single organ, to *a general law of the sensibility?* Can they refer to a single sense, the illusions of all the senses, which are much less numerous? Have they yet to learn, that each illusion of the senses bears the manifest impress of the instrument, on whose lesion it depends? Will they ever attribute to illusions of the hearing, *the longings* which are subordinate to the taste?

It is precisely so with the false ideas, the perverted sentiments, which are produced by the organs of the brain. Those writers, who have made insanity a practical study, have been compelled to establish two principal divisions, at least, of the disease; all mention lesions of *the affective qualities, of the intellectual faculties,*

lesions of the *understanding* and of the *will*; all adduce, in their support, facts, which exhibit injury of the *intellectual* faculties solely, the *affective* qualities being untouched, or, in other words, which evince lesion of the understanding, whilst the *will* remains unaffected, or *vice versa*.

I have already quoted many facts, observed either by Pinel or by myself; I will add one more only. "A man, whose occupation had been that of a mechanic, and who was afterwards confined in the Bicêtre, experienced, at irregular intervals, paroxysms of fury accompanied by the following symptoms; at first, a sensation of burning heat in the intestines, with intense thirst, and obstinate constipation; the heat extended by degrees to the chest, neck and face, which became flushed; until, having reached the temples, its violence increased, producing here very strong and frequent pulsations in the arteries, which seemed as though about to burst; the nervous affection finally reached the brain, and then the patient felt himself impelled by an irresistible propensity to commit murder, and, if he could have obtained a sharp weapon, would undoubtedly have slain, in a sort of phrenzy, the first person that met his sight. Yet, in other respects, he enjoyed the unimpaired use of his reason, even during the paroxysms; he answered all questions correctly, and no incoherence of ideas, no delirium was perceptible; he even had a sense of horror of his situation, and was deeply affected with remorse, as though this furious propensity were a crime."*

I have myself observed a similar fact. The subject of it was a corpulent man, who, from inertia in the intestines, was disposed to melancholy. He saw a criminal, a former acquaintance of his, broken upon the wheel, for an assassination attended by aggravating circumstances; so terrible an impression was occasioned by the sight of this spectacle, that, from that moment he

* On Insanity, p. 157 and 8, § 160.

thought himself possessed by the devil, who was urging him irresistibly on to commit murder ; having returned home, he called out, with furious gestures, to his sisters to flee, for he could not resist his headstrong impulse to destroy them. He then ran to my house, rushed precipitately into my study, and, in accents of despair, begged me to fly before him. "If you advance another step, I exclaimed, I will dash out your brains against the wall." My firmness brought him suddenly to himself. "How happy I am," he said to me, "at having met with one able to save me from perpetrating a horrible crime." And then he proceeded to give me an account of his lamentable state, in a confiding tone, but at the same time wringing his hands with anguish.

If we be compelled by similar facts to allow at least two sources of mania, it is necessary to suppose two organs also of different kinds, and then this single organ, this law of the singleness of the sensibility, is again at fault.

These two principal divisions, however, are far from sufficient to explain satisfactorily the different phenomena presented by mania. The various alterations, which the moral qualities and intellectual faculties undergo, are clothed in forms so diversified, that the subdivisions of the classifications would be as remote, and as distinct from each other, as the two great divisions themselves.

The warrior in his mania commands the elements ; with the breath of his mouth, he threatens destruction to earth and sea ; with a powerful hand, he strikes his muscular thighs, to teach the nations that the universe reposes upon immovable pillars ; with the might of his arm, he arrests worlds in their revolution, and his eye, glancing from beneath its divine lids, pierces beyond the stars. The melancholic, despite his Herculean stature, trembles at his shadow, sees himself overwhelmed by calamity and sorrow, and, in the midst of abundance, the thought of want coming upon himself and family, terrifies him : this earth he regards as no other than a val-

ley of tears, and, by night and by day, his own self-slaughter, and the destruction of those most dear to him, form the subject of his meditations. The voluptuary, abandoning himself to an intemperate imagination, passes whole days in the intoxication of sensual enjoyments ; even of the angels of heaven he creates the beauties who inhabit the seraglio devoted to his pleasures, and finds no happiness but in brutal self-abuse.

What is there in common between those three series of extravagant sentiments and false ideas ? Who will ever be able to refer them to one and the same class ?

The aggregate of the facts collected by Pinel, should, in despite of ideology, have induced this friend to truth to acknowledge the insufficiency of the two divisions, which he establishes. "Are not the words, human understanding, and will," he says, "generic and abstract, comprehending different intellectual or affective operations, whose isolated or united aberrations form the different species of insanity, and whose true characters, it is important, should be carefully determined." *

But, wherefore does he reject the doctrine of the plurality of the organs ? Its true and only object is to determine the fundamental powers of the soul and mind, and to erect immutable principles upon the functions of the brain, whether healthy or diseased.

Finally ; I ask the adversaries of the plurality of the organs of the cerebral functions, how a single and homogeneous organ can be at the same time in the most opposite states ? I ask them, if the eye, when it sees objects double or reversed, can see them single and erect also ? and yet, there is something absolutely similar in every case of mania, in which the affective qualities are deranged, and the intellectual faculties perfect, at the same moment ; there is something absolutely similar, in every case, in which particular functions only, or some of the functions belonging to one of the

* On Insanity, p. 55, § 63.

principal divisions are deranged; partial imbecility would be analogous to it in every respect. No! it is impossible that the aversion to the plurality of the organs can go so far, as to sustain the most apparent contradiction to affirm that an organ is healthy and morbid, in a normal, and an abnormal state, at one and the same instant.

Continuation of objections to the second pathological proof. Examination of the received ideas respecting derangement of the faculties of the soul and mind.

Objection.

M. M. Bérard and de Montégre adduce, on the one hand, cases from Pinel, and on the other, my own doctrine of the moral qualities and intellectual faculties, for the purpose of finding new proof against the plurality of the organs, in the apparent contradiction, between my doctrine, and the facts observed by the above-mentioned author. "On the other hand," they say, "Pinel has proved, by an immense number of facts, that mania almost always follows the grand divisions of the faculties admitted by all metaphysicians, (attention, mémoire, judgment, imagination;) that very frequently one of them is impaired, whilst the others retain their integrity perfectly; on the other hand, Gall himself, by an acute and profound metaphysical argument, demonstrates that these general faculties cannot have any peculiar organs. It must, therefore, be concluded from these two indisputable truths, that partial *circumscription* of the faculties by no means proves the existence of the separate organs." *

* Dict. des Sciences médicales. Art. Cranioscopie, T. vii. p. 310.

Reply.

It is true, that Pinel, in pages 58 and following, of his work, retaining the received division of the qualities and faculties, cites cases, in which, as he thinks, each of them is independently deranged. If, then, qualities and faculties be in reality isolated, as Pinel endeavors to prove, it is a matter of absolute necessity, that each one have its peculiar and appropriate organ. But are they really independent? and is it proved, by a single fact, of all those reported by this distinguished scholar? The observations of Pinel are accurate; therefore, it only remains for me to prove, that not one of his cases exhibits a disordered state of one quality or faculty only, whilst the others remained unaltered. The examination, which I am about to commence, will prove, in how much need medicine stands of a better philosophy of man, of a philosophy based upon facts.

*Lesions of physical sensibility in insanity.**

Pinel, § 68—§ 81, includes in the term, *physical sensibility*, the different impressions, which can be received by the nerves of internal parts, as the heart, lungs, intestines, kidneys, womb, &c.; as, for instance, the symptoms of stupor, of nervous irritation, which are occasionally precursors of mania, an extraordinary internal heat, felt by maniacs, their insensibility to cold, their absolute rejection of all nutriment, or their voracious appetite. In the same place, he also speaks of idiocy, both complete and partial, of furor uterinus, of that physical excitement of the generative organs of

* On Insanity, p. 58—70.

both sexes, which often forms one of the distinctive characters of insanity. All this, however, has nothing to do with the disputed division of the mental faculties.

*Lesions of the perception of external objects in insanity.**

The topic of § 82 is merely an inquiry, into what is passing in a patient's mind under access of mania, independently of the external world.

In § 83, Pinel gives a picture of an insane person, so entirely wrapped up within himself, as not to perceive external objects. But who does not see, that the perceptive faculty is not impaired in this case, that the patient has simply lost the power of directing it to external objects, for no other reason, than great derangement in the brain, occasioned by its state of extreme and irregular irritation, or rather of complete apathy.

§ 84 contains cases of idiocy more or less complete. Here, not only the perceptive faculty is impaired, but all the faculties of the mind are more or less enfeebled.

In § 85, Pinel speaks of the extreme sensibility of sight and hearing in maniacs.

In § 86 and 87, mention is again made of idiots, as enjoying their hearing at certain times, and being deaf at others.

§ 88. Childish insanity, though it may be more properly termed idiocy, in which the patient, about twenty-two years of age, passes from one extravagance to another, with the mobility of a child. In this instance, also, there is not only lesion of the perceptive faculty, but feebleness and versatility of all the faculties.

§ 89. Another case of partial mania and dementia. In this case of partial mania, the perceptive faculty remained unimpaired. In dementia, when all the facul-

* On Insanity, p. 70 & suivan.

ties are deficient, the perceptive faculties must also be deficient. What should we say of one, who maintained, that the oyster possessed every faculty, except that of perception.

§ 90. Progressive course of insanity. Passage from the period of excitement to that of apathy or dementia. The inquiry here does not, in the slightest degree, concern any lesion of the perceptive faculty.

Pinel, as is seen, does not relate a single case, in which the alienation consists solely of lesion of the perceptive faculty, and in which the other faculties remain unimpaired.

*Lesions of the attention in insanity.**

Pinel thus commences his § 92,—“At the highest degree of intensity of mania, when the understanding is thronged by a rapid succession of the most incoherent and disorderly ideas, the attention, as well as the judgment, and the internal feeling of self-existence is totally obliterated. Thus, then, we have general derangement, and by no means absence of the attention alone.

§ 93. A case of partial mania, in which the attention as well as the other faculties, hitherto admitted by ideologists, are unaffected in certain respects, and impaired in others.

§ 94, the same case as § 3. Profound melancholy, with lesion of the judgment and imagination. Therefore by no means lesion of the attention alone.

§ 95 & 96. Partial imbecility and incapability of attention, both in dementia and idiocy. But what faculty is not deficient in such a state?

§ 97. Partial mania;—convalescence;—a state, indeed, in which the exercise of the attention becomes gradually

* Page 76 & suiv.

possible; its restoration being coincident with that of the intellectual faculties, generally, to their natural condition. But there is nothing here about the attention alone.

Thus, in all the paragraphs just examined, there is not a single case, in which *lesion* of the attention is found to be the sole cause of mania, dementia, or idiocy.

Lesions of the memory, or the principle of association.

§§ 99 and 100. Incomplete mania. There is not a word in reference to integrity or lesion of the memory alone.

§ 101. Complete mania, in which all the faculties are impaired, consequently the faculty of association, as well as the others. Pinel thus commences paragraph 102:—"Memory, like the rest of the intellectual functions, appears to be suspended during the violence of certain paroxysms of mania." This general suspension has actually occurred in all the cases reported here.

§ 103. Partial mania, in which a moral quality appears to have been violently affected, and where, not only the memory, but all the intellectual faculties remained undisturbed.

§ 104. In all the cases quoted by Pinel from his own experience, and from Willis, all the intellectual faculties, and by no means memory alone, are found in a high state of excitement.

§ 105. A notary, having had an attack of apoplexy, forgot his own name, that of his wife, children, and friends, and yet he remembered many other things.

Here, then, there is no loss of general memory, but merely of the *memory of names*, which is, in fact, a peculiar primitive power, as I shall demonstrate when treating of the fundamental qualities and their organs.

§ 106. Pinel speaks of an idiot, who could not retain a single perception—who was totally unable to fix his attention on any thing, or to compare two ideas. Thus,

we have, again, a general lesion of the faculties. Therefore, in none of the cases adduced, is there *lesion or integrity, of memory alone.*

*Lesions of the judgment in insanity.**

In paragraph 108, Pinel speaks of the great confusion often observed at the commencement, and even during the course of mania, in the language, ideas, gestures, features and moral affections; a disorder which announces a subversion not of the judgment only, but of all the intellectual faculties; therefore, the cases seen by him, are cases of general mania, and by no means lesion of the judgment alone.

§ 109. Mania originating from pride, attended by lesions of memory, judgment and imagination.

§ 110. Mania from partial lesion, or exaltation of a propensity of an inferior order, the superior faculties remaining sound. By no means accompanied with integrity of the judgment only, but with a simultaneous integrity of perception, attention, memory, &c. also,

§ 111. Mania arising principally from ambition; but nothing to warrant the conclusion, that the judgment alone is deranged.

In paragraph 112, Pinel says,—“It is impossible to conceive the nature of a certain kind of alienation, which appears to be a mixture of reason and extravagance, of judgment and true delirium—states which seem to exclude each other reciprocally.”

When this medley occurs at intervals only, it is a mania, which, like certain fevers, has its periods of intermission and access. When, on the contrary, the confusion is continuous, it is certainly inconceivable, on the philosophical doctrines hitherto received. But, take the theory of the primitive powers as the point of view whence to

* On Insanity, p. 92, and suiv.
26*

make observations, and it will be easy to understand how one primitive power may be deranged conjointly with all its attributes, memory, judgment, imagination, &c., whilst another primitive power with all its attributes, memory, judgment, &c., retains its entire integrity. There are other similar phenomena, which should have made men of observation aware long ago, that their philosophy of the mental powers was erroneous ; for truth is never found in contradiction with even a single fact. Besides, even looking at the subject as Pinel does, the judgment alone is not disordered in the cases presented ; perception, attention, memory, imagination, are equally deranged.

§ 113. Pinel commences this paragraph thus : "The faculty of judging, an author has ingeniously remarked, is the same in the insane, as in the sane." When an insane person judges that the government of the world is in his hands, that the seasons obey his voice, that at his pleasure he can dry up the waters of the Ganges, &c., he judges so, because the perceptions which are present in his mind, force him to such conclusions. His errors of judgment spring solely from the materials on which the faculty is exercised.

But, if the faculty of judging be the same in the insane as in the sane, wherefore does Pinel undertake to adduce instances of insanity, in which this faculty is deranged ?

Moreover, such reasoning is but mere sophistry. Who will ever allow that an individual judges correctly in the impetuosity of passion, in imbecility, in dementia, in alienation of the superior intellectual faculties, in cerebral inflammation, at that period of nervous fever when the irritation is at its height, because his actions are conformable to his impressions ? The judgment is always wrong, whenever the true relations of things, the real connection between several ideas and sentiments, are misunderstood. Who will allow a sound judgment to the patient who cannot rectify his idea, that the elements are submissive to him, or, to him who fears

that on the least motion his legs will break, like glass ? Can an individual be said to judge, when he allows himself to be blindly swayed by external or internal impressions ? If so, then the wild boar judges, when he precipitates himself upon the boar-spear.

§ 114. Pinel says,—“On the decline of mania, or when it threatens to terminate in dementia, a feebleness of the judgment, depending upon a greater or less obliteration of the memory, is observable.” In such case all the faculties are obliterated.

§ 115. Imbecility, in which the subjects possessed a very decided faculty of imitation, which, certainly, cannot be a derivative from the judgment.

Where, I now ask, in the whole ground which we have just surveyed, is there an instance of lesion of the judgment, and of the judgment alone ?

*Errors, or extravagances of the imagination in mental alienation.**

§ 120. “I consider the imagination,” says Pinel, “as the complement of all the functions of the understanding, because it seems to dispose of the anterior perceptions of memory, judgment, moral affections ; and forms them, as it pleases, into pictures of more or less regularity.” If this be the case, how will he ever be able to prove that the imagination alone is deranged ?

§ 121. Sudden excitement of the intellectual faculties, occasioning an entire subversion of all ideas.

§ 122. Examples of exaltation in partial, religious mania : in this paragraph Pinel renounces the definition of imagination given above, § 120. “Here it is not a reminiscence, but intuitive knowledge, a true internal illusion, analogous in its effect to that which might be excited by a vivid impression on the organ of sight.” Thus he returns to my view of imagination, although in the preceding page he had rejected it.

* On Insanity, p. 106 and suiv.

§ 123. Vanity exalted ; with entire loss of reason.

§ 124. Pride and vanity predominant ; with exaltation of all the superior faculties.

§ 125. In this paragraph Pinel again rejects recollection, in the two last cases which he quotes : the young insane, who, during her accesses, composed harmonious verse, and the woman who displayed, in her's, a rare facility of versification, had never made any previous attempts at poetical composition. Here then is exaltation of a primitive faculty, but by no means lesion of the imagination, as understood by our author.

§ 127, 8, 9, 130. Examples of hypochondrium and melancholy, with exaltation of certain trains of sentiments and ideas ; for instance, of caution, pride, devotion, propensity to murder ; all these sentiments and ideas may be reduced to their fundamental powers, to caution, to the feeling of elevation or pride, to the sense of right and wrong, and to the sentiment of destruction. Here, then, there is not the least question with respect to the imagination, whether morbid or healthy.

To what, finally, do the observations of Pinel amount, if the mental faculties hitherto received are not what they were supposed to be ; if, as some modern philosophers teach, they can all be reduced to *the understanding and volition, attention, comparison, reasoning, desire, judgment, liberty* ; or otherwise, to a simple modification of *the sensations* ? *

Further on, Pinel treats of the passions, of the shocks experienced by the moral character, and of the changes which may happen to it in alienation.

In §§ 116—119 and 131—134, he proves, anew, how distinct lesions of *volition* may be, from those of the *understanding*, although these two faculties are oftentimes simultaneously deranged.

Moreover, he adduces instances of exaltation in organs, whose excessive involuntary activity disturbs the

* Dictionnaire des Sciences Médicales, t. xiv. p. 401.

good order of society ; as for instance, when certain fundamental faculties degenerate into propensities to steal, quarrel, murder, or unbridled licentiousness, &c. Some of the cases in question depend upon general feebleness of all the faculties, and irregularity in the alternate action of the superior and inferior faculties.

Pinel, then, unintentionally indeed, does but furnish corroborative proofs that the phenomena of alienation, when compared with the ideas entertained of the insane by Locke and Condillac, do really appear, as he himself says, somewhat enigmatical.*

Observations on the mode in which individual lesions of the intellectual faculties, hitherto admitted by philosophers, are considered by Esquirol.

Esquirol has undertaken, in imitation of his master, to furnish cases, exhibiting independent lesion of the attention, of the association of ideas, of memory, of judgment, &c. ; but his philosophic method is so singular, that I shall not take upon myself to detain the reader a long time ; a few examples will be sufficient.

“ If the capability of attention be impaired, as in dementia, by an internal diseased state.....”† But dementia, according to Esquirol himself, is an extinction of all the faculties :‡ consequently the attention alone is not enfeebled.

“ How can the judgment be in relation with the ideas, when those supplied by the *imagination* are so numerous, that they come in throngs, with eager haste, precipitating themselves confusedly forward ? ”§

Here, again, all the faculties are deranged, and by no means the imagination alone, to which Esquirol

* On Insanity, p. 102, § 117.

† Dict. des Sciences Méd. t. viii. p. 252, art. Delire.

‡ Dict. des Sciences Médicales, t. viii. p. 280 and suiv. Art. Démence.

§ Ibid. p. 251—252.

assigns the character of an imaginary being, which transmits confused ideas to the judgment.

In a similar manner, Esquirol personifies, as it were, the faculty of the association of ideas, a faculty, whose exaltation, according to him, disturbs the judgment.*

"Memory is sometimes so enfeebled, that it no longer possesses the power of uniting actual sensations, either with the perceptions arising therefrom, or with ideas previously acquired; it no longer grasps the mutual relations of objects or ideas; it has ceased to supply ideas of intercommunication; insomuch that *the patient reasons wrongly, simply because he has not sufficient strength to reason rightly.*"†

"Delirium, particularly in vesania, always perverts the moral affections."‡

I conclude, by observing that I have been unable to find in the compilations of Esquirol, the slightest ground for suspecting the existence of cases, in which only one of the mental faculties, hitherto received among metaphysicians, was individually and exclusively deranged.

Continuations and conclusions of the objections.

Rullier, after having stated the opinions of many philosophers as to the number of the intellectual faculties and propensities, thus continues: "Shall we take this occasion to remark, that such a disagreement is scarcely fitted to confirm the peculiar doctrine of Gall, which allows of special organs of the *intellectual faculties and properties?* Before determining these particular instruments, however, it would, unquestionably, be necessary to have a clear knowledge of the number and species of the fundamental *propensities*, as

* Dict. des Sciences Médicales, p 252.

† Ibid. p. 252.

‡ Ibid. p. 253.

Gall terms them. Now, in a theory of this kind, it is scarcely to be expected that Gall will be more fortunate in ascertaining the organs of the faculties, than his predecessors were in determining the faculties themselves. Without pretending, however, to prejudge the question, in this respect, let me add, that various objections have been offered by my estimable friend, M. Séné, to the speciality of organs of the faculties admitted by Gall and Spurzheim. M. Séné very honestly believes, with almost the whole body of physiologists and philosophers, that the entire brain represents, by the mass of its material parts, the universal instrument of the mind. He maintains, that, by recurring to the idea of special organs appropriated to the exercise of certain *faculties* or certain *propensities*, we inconveniently and unnecessarily multiply the wheels of the animal machine; moreover, it is a contrivance, of which we have no satisfactory proofs. The admirable remarks of M. Séné on this subject will be consulted with pleasure by my readers; they form a sequel to his analysis of the large work of Gall and Spurzheim, as far as it has been published. See Bibl. médicale, t. xlivi. p. 165 and suiv.*

A knowledge of all the primitive powers and their organs, is by no means requisite in order to determine a certain number of them. Naturalists find no inconvenience in establishing many classes, genera, and species of animals, previously to an acquaintance with each individual animal. The inquiry, whether I have been more fortunate than my predecessors in settling the primitive powers, as well in man as in animals, is partly answered by what has been said in the preceding sections, and will be completely solved in the discussion of the fundamental powers and their special organs. I am now going to submit to my readers the excellent remarks of M. Séné, in order to satisfy fully both them and the adversaries of organology.

* Dict. des Sciences Médicales, t. xiv. p. 403.

Objection.

M. Séne observes : "An invariable result of the want of exercise is organic atrophy and future functional inability. How have the organs of the propensities and inclinations, which, since the creation of man, have slumbered in absolute repose, because the things to which they are applicable have been known but a short time, or even yet remain undiscovered—how, I say, have these organs escaped the dominion of the universal law ?" *

Reply.

When organs remain for a long time inactive, I agree that they are less developed, that they acquire less vigor, and possess less aptitude for action, than if they had been kept in a state of activity ; but there is not a single instance in nature, in which, under similar circumstances, they have totally wasted and become absolutely incapable of action. Again ; What propensities or inclinations have reposed in perfect inaction since the creation ? Is there any quality of the mind, any passion, affection, or faculty whatever, to which this remark is applicable ? Is it the propensity to physical love, the love of offspring, friendship, pugnacity, the propensity to rob, murder, or deceive ; vanity, pride, jealousy, revenge, sadness, joy, anger, or fear ? When, since the days of Moses or Homer, have we been enriched with a new intellectual faculty ? In the most remote period of antiquity, the club inspired fear ; in our days, the bullet does the same ; but has the nature of fear changed ? The child is proud because he has gained the prize at school ; will he need a new organ to enable him to be proud of having gained a victory on the field of battle ? The physician observes the symptoms of disease, and the philosopher, the

* Bibl. Med. xi. year, No. 128, t. xlvi. Feb. 1814, p. 166.

different forms in which the folly of mankind displays itself; but does the physician require one spirit of observation, and the philosopher another? Does nature keep a stock of stomachs in reserve, till sensuality invents new delicacies? or new eyes, for shades of color as yet unknown?

Objection.

"If, notwithstanding the labors of Gall and Spurzheim, and their predecessors, the number of faculties of the soul and of the mind, of the inclinations and propensities, yet remains undetermined, which we very much fear, new organs will have to be discovered, in proportion as more severe analysis renders the admission of the new faculties necessary." *

Reply.

Something, much indeed, has been done, when deeply-rooted errors are eradicated, and even a small number of the primitive mental powers have been ascertained beyond doubt. Those, by whom the voids which we leave behind shall be filled up, will have a claim upon the gratitude of every enlightened mind.

Objection.

Gall and Spurzheim, for the purpose of limiting the number of the organs of the faculties and propensities, probably consider many dispositions as simple modifications of the *properties* of the soul admitted by them. But, may not this hypothesis be advantageously used to sup-

* Bibl. Med. xi. year, No. 128, t. xliii. Feb. 1814, p. 166.
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port the unity of the mental organ, by applying to its faculties, what they concede to the modifications, of which the organ of each faculty or propensity may be susceptible? This difficulty, it strikes us, can be removed only by devoting a special organ to each modification of the faculties and propensities; but this will precipitate us anew into the obscurity of the infinite.

In fact, a throng of sciences and arts, of which, at present, we can form no idea, new tastes and novel propensities will demand appropriate organs in the brain. Will their material points, however numerous we may suppose them, be sufficient for the establishment of all the *properties* or dispositions, whose development, after the lapse of many ages, shall meet the wondering gaze of the observer?"*

Reply.

We are far from regarding any particular propensity as a simple variety of a mental faculty, though we think it susceptible of many modifications, of numberless shades, either originating within itself, or produced by the influence of other organs or other faculties. The organ of singing is the same organ in the lark, the tomtit, and the nightingale, although differently modified in each individual of each of the feathered species. In the same manner, the organ of music is differently modified in Handel, Gluck, Mozart, Haydn, &c. The love of glory, united with a propensity to murder or highway robbery, acts far differently from what it does when accompanied by philanthropy or a talent for poetry, &c. Thus there are infinite modifications of the same quality or faculty; the number of the letters of the alphabet is determinate, although the words and

* Bibl. Med. xi. year, No. 128, t. xliii. Feb. 1814, p. 166 and 167.

phrases which can be formed from them are innumerable.

If M. Séné required a new cerebral organ for each new science, art, or taste, he must also ask for a new nose for each new odor ; new legs for each new dance. If this take place, *what an extensive field* will be opened, after some thousand years, to the wondering gaze of the observer !

Objection.

"Gall and Spurzheim think that the *properties* of a superior order modify those of an inferior one, and vice versa. Now, in each property, as simple tendency to action cannot, as our authors suppose, produce this effect, it would, at the utmost, cause a simultaneous action of two or more *properties*, more or less opposed, but could not rectify one by means of another. Such a result would rather depend on the influence, exerted by the organs of one order, over those of another. Now, on this hypothesis, there should be a central organ, a medium of union and relation between all the special organs of the properties. Then, why may not this organ, which would, as it were, maintain the balance between all the others, why may it not, itself, be the sole essential condition of the mind ?" *

Reply.

It is a general law of nature, that superior powers rule those of an inferior order. The laws of chemistry, control the laws which regulate moving powers, and, in their turn, are controlled by the laws of animated organism. Crystals form in spite of the laws of gravity ; life

* Bibl. Med. xi. year, No. 128, t. xlivi. Feb. 1814, p. 167 and 168.

prevents fermentation and putrefaction, and raises the heavy arm.

The same law holds good in the moral world, also. The feeble-minded succumb beneath each of their propensities; the judicious tranquillize theirs, or assign to them time and place when to appear. But are these phenomena, therefore, identical, and the result of one and the same cause? Because, by superior powers, we can arrest and modify the action of the instruments of our external senses, does it follow, that there is a central power for these instruments, these senses—a single power, whose modifications give birth to the different functions of the senses and the other instruments? It has, indeed, been proved that the entity, *I, (moi,)* exists, notwithstanding the great diversity of instruments of the sensations of faculties: I say, its existence has been proved, but the mode of proof I shall never attempt to explain.

Objection.

“But what utility is there in multiplying, unnecessarily, and especially without decisive proof, the wheels of the animal machine? If the organs of more material functions be susceptible of very striking changes within a very limited time, in their mode of feeling and acting, why should it not be so with the brain, considered, in its essential parts, as an indivisible organ, and the principal condition of the exercise of the intellectual faculties? Primitive differences in temperament, whether general or partial, inducing infinite varieties from the influence, exerted by each organ of the animal economy over the others, and consequently over the brain, enable us to conceive (as far as it is possible) of the primitive differences of the mental *properties*, without having recourse to the existence of a special organ for each faculty or propensity.”*

* Bibl. Med. xi. year, No. 128, t. xlivi. Feb. 1814, p. 168.

Reply.

In this work, I have proved, generally, the necessity of conceding the plurality of the organs: in speaking of the fundamental faculties, I shall demonstrate the necessity of allowing a special organ for each of them. All organs, whether of vegetative or animal life, may experience alterations from disease, time, &c.; but not one of them can be converted into another. The heart will never be transformed into a stomach, nor the liver into an intestinal canal. The functions of one sense will never be exchanged for those of another. Neither are the propensities or faculties generally, nor the passion of physical love, and vanity, the memory of names, and a talent for poetry, in particular, reasonably deducible from the same source. "What is the utility of unnecessarily multiplying the wheels of the animal machine?" This incessantly repeated objection is the offspring of vanity and presumption. Such was the language used towards the discoveries of physicians, who lived at the time when all the phenomena of nature were explained by means of the four elements. The natural philosopher seeks for facts, and troubles himself but little about what appears necessary or superfluous, to the indolent sophist.

I have already demonstrated,* that the doctrine, which teaches that the moral qualities and intellectual faculties are determined by temperament, has no place, except among by-gone prejudices.

The remarks of M. Séne, in opposition to the plurality of the organs, are, therefore, absolutely insignificant.

* P. 140, & suiv.

*State of Waking, Sleep, Dreams, and Somnambulism,
so far as these different states are confirmatory of
the plurality of the organs.**

Wakefulness.

In order to leave nothing obscure, I am compelled to repeat at this time, what I have said elsewhere,† respecting the difference of vegetative and animal life. The vegetative life, both of animals and man, perfectly resembles the life of plants. All its functions are involuntary and unconscious. All the functions of animal life, on the contrary, are accompanied by consciousness, by perceptions, and both animal and man enjoy the power of acting voluntarily upon its organs.

The question now arises—What is wakefulness? It is that state in which impressions, either proceeding from without, or originating within, are perceived; in which the animal can act voluntarily upon the organs of animal life. I do not say that, during wakefulness, all the organs of animal life are, of necessity, active; but only, that animals or man, as long as they continue in health, and awake, possess the power of making each of these organs act in obedience to the will.

When all, or part of these organs, are in involuntary activity, the individual is said, according to its degree or duration, to be in a state of intoxication, delirium, exaltation; to be more or less insane, a complete or partial maniac; or else, that he is in a reverie.

* Some of my readers, perhaps, will find this chapter too short, but they will have the goodness to remember, that I here treat of the various topics which it contains, only so far as they furnish proofs in support of a plurality of the organs.

† Vol. i. 1st Sect.

Sleep.

From the moment of conception, or the first instant of existence, until death, the organs of vegetative life act uninterruptedly, and with varying energy. They find within themselves means of renewing the strength which their own action exhausts. Not so with animal life, whose organs, fatigued and exhausted by the exercise of their functions, require intervals of repose to enable them to recover the vigor necessary for continuance of action. Now, when in health, all the organs of animal life are sunk in such repose, that impressions, whether external or internal, are unperceived, and the will can no longer exert any control over them ; then, the individual is said to *sleep*, to be sunk in *deep* and *perfect sleep*.

Sleep is not uniformly needed to recruit exhausted energy. The animal life, may in some way or other, become habitually and completely inactive ; then, one sleeps from ennui, &c.

When the action of animal life is interrupted by disease, its state of inaction is denominated *catalepsy, lethargy, asphyxia, &c.*

There has been much dispute on the question, whether the mind can ever exist, as for instance, in sleep, without sentiments, without ideas ? If we set aside idle metaphysical refinements, its solution is very easy. In this life, the mind receives its sentiments and ideas through the cerebral organs ; when, therefore, they are completely inactive, it can be possessed neither of sentiments nor ideas. Deep and perfect sleep is a temporary suspension of the existence of the sentient, *I, (moi :)* the essence of the mind consists neither in thought nor volition, which, as has been happily observed by Locke, are modifications only of the mind.

Dreams.

Almost all physiologists unite in saying, that in dreaming, animal life is partially active. They are right ; and yet they deny the plurality of the organs ! It is impossible, however, to conceive of dreams, except by supposing the existence of this plurality. When certain organs of animal life become active during sleep, the sentiments and ideas, dependent on them, must of necessity be awake ; but in this case the activity is involuntary.

When one organ, only, is active, the dream is simple ; she whom we love is folded in our arms ; delicious music is sounding in our ears, or we are engaged in contest with enemies, as the functions of one or another organ are active.

The greater the number of organs simultaneously active, the more complicated, confused, and incongruous will be the action which the dream represents.

Ordinarily, when the organs are exhausted by wakefulness and exertion, no dreams appear during the first hours of sleep, unless the brain be extremely irritable. But, as their fatigue passes off, they are more disposed to activity, and hence, on the approach of morning, dreams are more frequent and more vivid. Dreaming, then, is, in reality, only a state of partial wakefulness of animal life, or, in other terms, an involuntary activity of certain organs only, during the repose of the remainder. Thus the phenomenon, dreaming, forces us to admit the plurality of organs for the moral qualities and intellectual faculties.

How happens it, that certain faculties display more energy in a dream, than in wakefulness ? What precaution do we take, when wishing to think profoundly on a subject ? We exclude all external impressions, we cover our eyes with our hands, shut ourselves up, in order to consecrate our entire attention upon a single

point. So it is in dreams. The whole vital strength is concentrated in a single organ or a small number of organs, whilst the others sleep; hence their action must of necessity be more energetic. The sentiments and ideas awakened in dreams are, sometimes, perfectly free from every thing irrelevant. It should, therefore no longer be matter of astonishment, if, like Augustus Lafontaine, we occasionally compose exquisite poetry in sleep, or, like Alexander, sketch the plan of a battle, or, like Condillac, solve difficult problems, or, like Franklin, we find furnished in the morning, a plan designed the preceding eve; or, if we discover during sleep, the true relations of those things, which, amid the confusion of sentiments and ideas, had defied our penetration.

It is a mistake, to believe that dreams are always a recurrence of sentiments and ideas, previously entertained. Man may invent in his sleeping, as he does in his waking hours; for, the internal sources, whence the sentiments and ideas flow, are the same in sleep as in wakefulness.

Somnambulism.

Somnambulism is distinguished from dreaming, simply thus; dreaming consists merely of sentiments and internal ideas; while in somnambulism, one or more senses become susceptible of external impressions, and one or more instruments of voluntary motion are thrown into action. It exists in various degrees, an examination of which, commencing with the feeblest, will quickly enable us to understand the most astonishing phenomena presented by it.

When, in spite of every exertion to keep awake, we find it impossible to resist the overpowering tendency to sleep, such sleep is partial only, that is to say, that, though asleep, in certain respects, we still remain awake in others; *we slumber*, we still continue to hear what is

passing around us : in this way persons dose on horseback, or, when marching, but suddenly start up, from time, to to time completely awake.

Generally, in the morning we do not get thoroughly awake all at once ; we still slumber, but we hear the cocks crowing, and the rumbling of wagons, a proof that certain organs may be independently active, not only in the stir of internal sentiments and ideas, but likewise in their susceptibility of external impressions.

A very vivid dream often throws into action many parts, which are subservient to voluntary motion : we make exertions to escape a danger, &c., we scream, talk, laugh ; even animals make similar movements in their dreams ; the dog barks, and stirs his legs, &c. In these instances, the activity (or wakefulness) has extended even to the organs of the voice, and to the extremities. Occasionally the sleeper during his dream, hears so as to allow of conversation with him : in this case, both the external and internal instruments of hearing are awake. Here is a new confirmation of what I affirm, that certain organs or senses may be independently active, whilst the remainder are buried in deep sleep.

No one doubts the possibility of hearing during a dream. Is it possible to see ? Facts will decide this question.

A young man of Berlin, sixteen years of age, experienced, from time to time, paroxysms of a very extraordinary nature ; he tossed about in his bed, unconsciously ; his motions and his gestures evinced a great activity of many of the internal organs ; he was unconscious of every thing done to him ; at length, he leaped from his bed, and with hurried steps traversed the ward ; at this time his eyes were open and motionless. I set different obstacles in his way, which he either put aside, or else carefully avoided ; he, then, suddenly threw himself upon his bed again ; again tumbled about for some time, and ended by awaking with a start, not a little astonished at the number of curious observers, by whom he was surrounded.

M. Joseph de Roggenbach, of Fribourg, in Brisgau, stated to me, in presence of many witnesses, that in his youth he had been a somnambulist. During his state of somnambulism, his tutor often made him read ; he was made to look after places on the map, and he found them more readily than when awake ; his eyes were always open and motionless, the whole head turning where a movement of the eyes would have answered. Frequently he was prevented from moving, but he was conscious of the restraint, endeavored to free himself, and begged to be released, but still he did not awake. Sometimes, he said that it would awake him, if he were led into the garden, and this never failed to happen.

I, also, knew an instance of a miller, who, while dreaming with his eyes open, went into his mill, occupied himself there, as he usually did in the day-time, and then returned to the side of his wife, without having the faintest recollection, in the morning, of his night's work.

There are, then, some somnambulists who see ; and the opinion of certain visionaries, who think that the perception of external objects, by somnambulists, is through the internal senses only, is refuted.

It is proved by experiment, that those somnambulists who keep their eyes closed, strike against obstacles put intentionally in their way, tumble into holes, &c. When having their eyes shut, they come to a familiar spot, they recognize where they are, as the blind do, by means of the sense of local memory.

Just as the ears and eyes may be awake during a dream, so may other external senses. The odors around are perceptible to the smell ; the taste recognizes a bitterness or sweetness in the saliva, after bad digestion ; heat, cold, &c., are sensible.

There are some, who think somnambulism a state altogether extraordinary, because its subjects execute, during their sleep, things in which they would have failed when awake ; they climb trees, mount upon house-tops, &c.

But the whole wonder disappears, the moment we reflect upon the circumstances under which the most daring feats may be accomplished, and upon those in which they are impossible. There is one, who, when standing on a balcony surrounded by a balustrade, at the top of a very lofty tower, can turn his eyes downwards without seeking security from the balustrade. Every one can walk, without wavering, upon a very narrow lath laid along the floor. What perils are there, to which boys do not accustom themselves in their venturesome sports? What is there left unexecuted by the rope-dancer, mountebank, and the mountaineer, who hunts the chamois? But remove the balustrade from the balcony, open an abyss on each side of the lath, and destruction follows. And why? Is it that we are unable to walk on the lath? By no means; but fear has paralyzed our confidence in our powers.

Now let us analyze the somnambulist. "He sees clearly what is to be done, but the organs, which should warn him of his danger, are locked in sleep; he is, therefore, fearless, and executes successfully whatever his corporeal activity will permit him to undertake. Awaken him, and that instant he sees his danger, and is lost.

Recapitulation.

Having endeavored to prove, in the preceding volume, that the moral and intellectual dispositions are innate, and that the manifestation of the moral qualities and intellectual faculties is possible, in this life, only by the aid of material instruments, I have endeavored, in this volume, to determine the material conditions essential to this manifestation, abstaining from all discussion on the nature and seat of the mind. I have shown the importance of studying the structure and functions of the brain—have made a division of the functions of animal life into two classes, the first of which includes the sensitive faculty, voluntary motions, and the functions of the senses; the second, the moral qualities, and intellectual

faculties, the propensities and sentiments—have determined the brain to be the exclusive organ of the functions of animal life of the second class—have demonstrated, that the instincts, propensities, constructive instincts, sentiments and faculties, are seated neither in the viscera, nervous plexus, and ganglia of the chest or abdomen, nor in the nerves of the senses ; and that they are not determined either by temperament or general constitution of the body—have, on the contrary, demonstrated, not only by the aid of comparative anatomy, but by that of physiology and pathology also, that the brain must be recognized as the exclusive organ of the moral qualities and intellectual faculties—and, finally, have refuted the objections to my doctrine, derived from cases in which it was averred, that the action of the moral qualities and intellectual faculties continued, though the brain was dissolved or disorganized, by water, annihilated, ossified, petrified.

I have noticed the attempts hitherto made, to find a measure of the moral qualities and intellectual faculties, applicable both to man and animals—have demonstrated that this measure is to be found neither in the absolute volume of the brain, nor in the proportion between the volume of the encephalon and the size of the body, nor in the proportion between the brain and the nerves, nor in that between the brain and the face, nor between the brain and the neck, nor, finally, in the relative proportions of the cerebral parts to each other—have shown that neither the facial angle of Camper, nor the occipital line of Daubenton, furnish this rule—have resolved the question : Is there a form of the head, from which the existence of mania or dementia may be inferred?—have examined the influence of a large and a small brain, of a large and a small head, over the manifestation of the intellectual faculties—have observed, finally, that with an equal quantity of encephalon, with equal dimensions of the head, the instincts, propensities, constructive aptitudes, sentiments and faculties, may not only be different, but also manifest themselves in very different degrees ; that

with an equal encephalic mass, the same qualities or the same faculties may be very active in one individual, and very dull in another. I find an explanation of this phenomenon in the circumstance, that certain parts are eminently developed in the brain of one of these individuals, which, in the brain of the other, are only moderately so. From these facts I conclude, that different cerebral parts execute totally distinct functions ; whence I am naturally led to admit the plurality of the organs.

In the third section of this volume, I have demonstrated the plurality of the organs by numerous anatomical, physiological and pathological proofs ; and have refuted objections, emanating from the humblest as well as the most distinguished writers. Finally, somnambulism, and the phenomena of dreams, have confirmed my doctrine on this point.

In order to remove all obstacles to the discussion of the fundamental powers themselves, their organs, and the locality of the organs, it still remains for me to show the possibility of determining from the shape of the cranium, or of the head, not only the form of the brain, but also the degree of individual development of each of its integrant parts, and to point out the means which I have employed, to discover the functions of determinate cerebral parts ; in other words, the seat of the organs. These two points will be the subjects of the third volume. In the following volume, I shall treat of the fundamental powers and their organs, and of many very important general results, which are immediate deductions from the physiology of the brain.

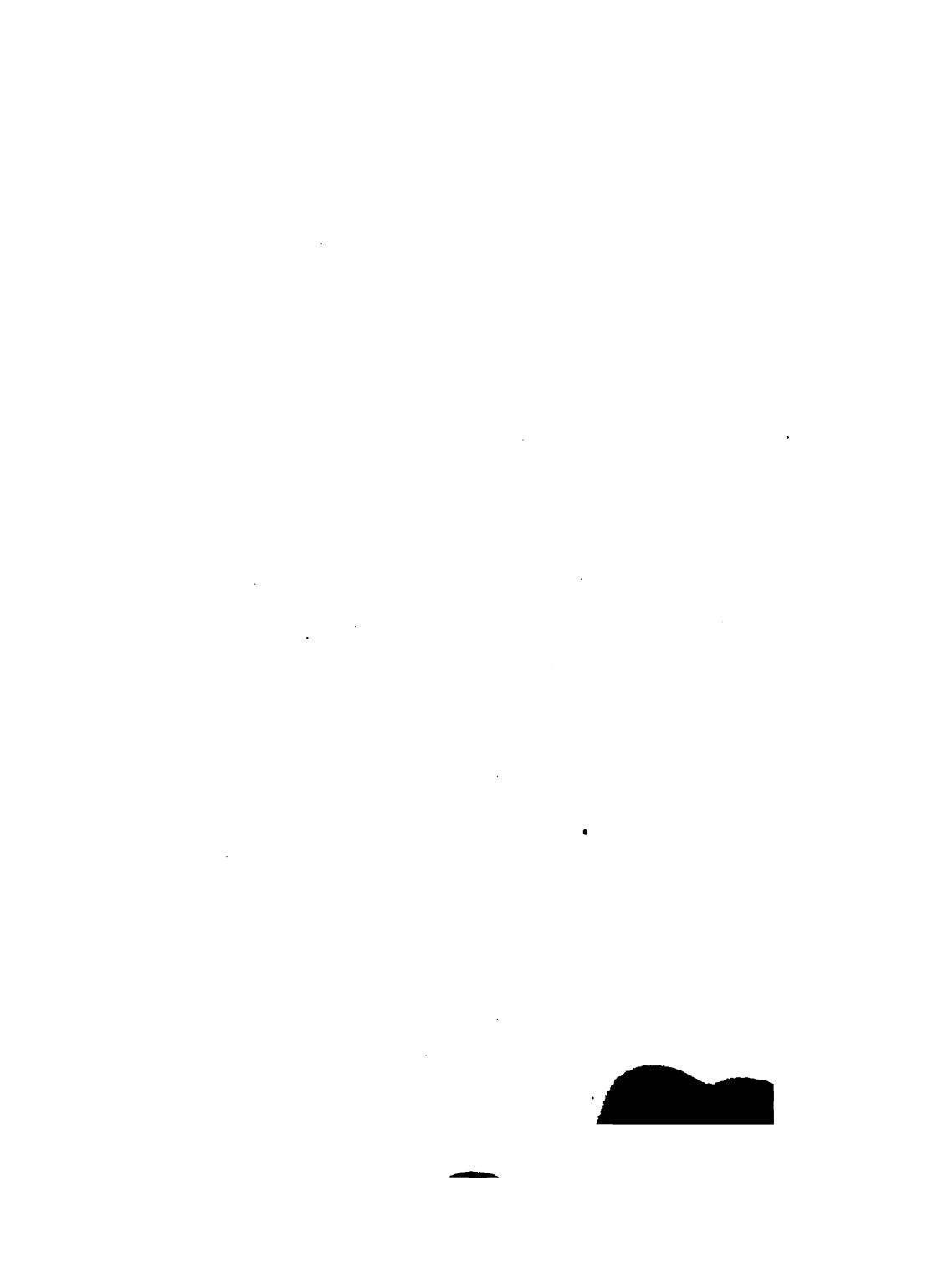






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